SUPPLEMENT.

The Mining Journal,

RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

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No. 2092.—VOL. XLV. LONDON, SATURDAY, SEPTEMBER 25, 1875. PRICE (WITH THE JOURNAL) SIXPENCE. PER ANNUM, BY POST, £1 4s.

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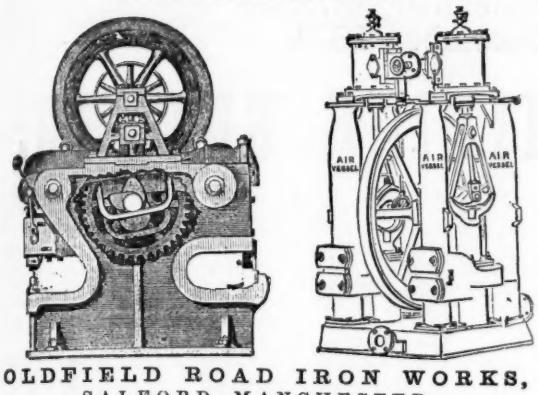

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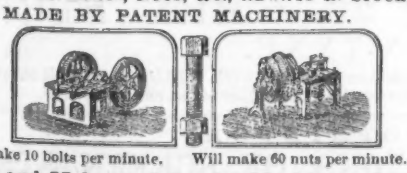

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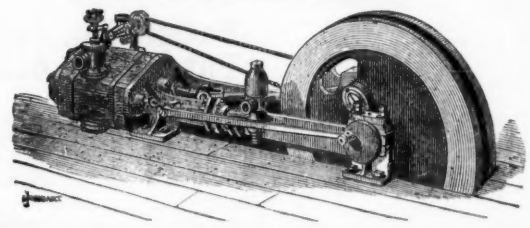

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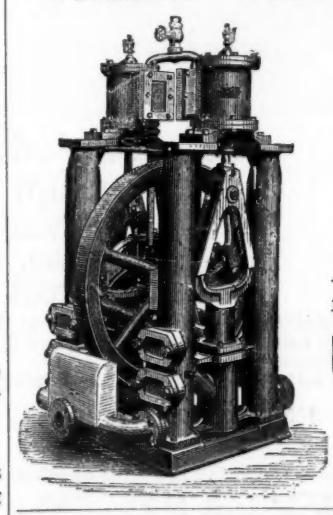

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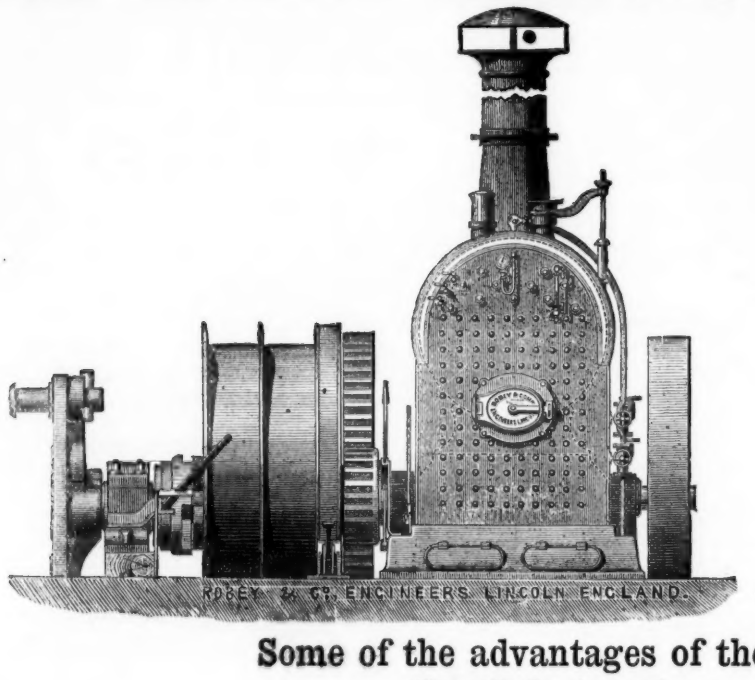

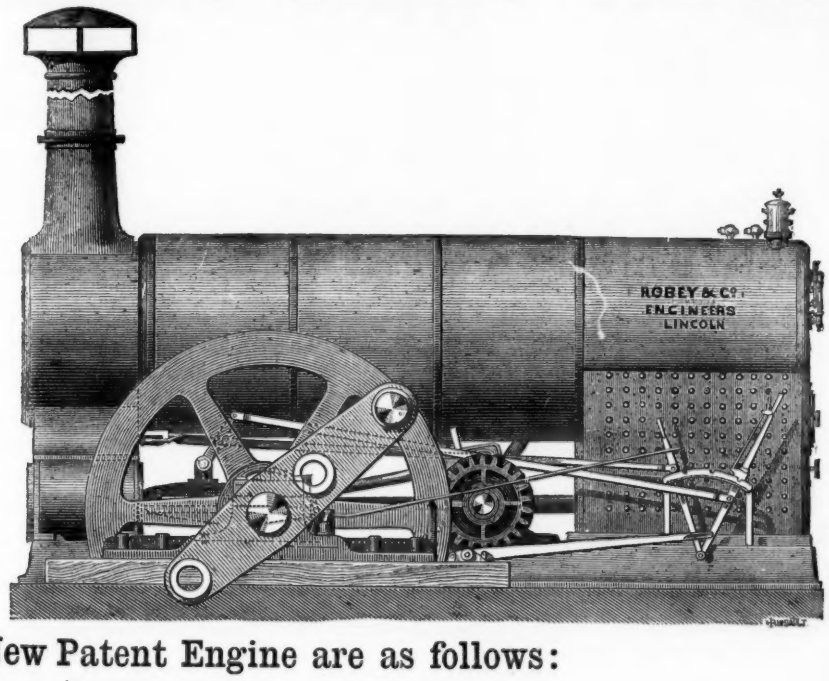

Some of the advantages of the New Patent Engine are as follows:

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THE EXTRAORDINARY ADVANCE in the PRICE of COALS has DIRECTED more ATTENTION to WATER-POWER, and to the BEST MANNER of APPLYING IT. For many years it has been, to a great extent, neglected and undervalued. One great objection to it has been the variable nature of most streams in these countries, having abundance of water during the winter half-year, and very little in the dry season. No kind of wheel hitherto known was able to give the proper proportion of power from the smaller quantities of water, so that it became the practice very generally to use steam entirely during the summer half of the year, letting the water go to waste. This is now completely prevented, and the full available power can be obtained from a stream at every season by using

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This wheel (which is now largely in use in England, Scotland, and Ireland) is the only one yet invented which gives proportionate power from both large and small quantities of water. It can be made for using a large winter supply, and yet work with equal efficiency through all variations of quantity down to a fifth, or even less if required. It is easily coupled to a steam-engine, and, in this way always assists it by whatever amount of power the water is capable of giving, and, therefore, saves so much fuel.

This Turbine is applicable to all heights of fall. It works immersed in the tail-water, so that no part of the fall is lost, and the motion of the wheel is not affected by floods or back water.

References to places where it is at work will be given on application to the makers,—

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Suitable for QUARRYING and OPEN CUTTING, SINKING SHAFTS, SUBMARINE BLASTING, TUNNELLING, DRIVING ADITS, &c., is the most simple and economical Drill now in use. Has no spring and pawl, or ratchet-gear to get out of order. Numerous "Cranston" Drills have been supplied into the Hematite Iron and Lead Mining Districts of Cumberland. This Drill is also in extensive use in Sweden, Belgium, India, and various other places.

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STEAM BOILERS; AIR COMPRESSORS, worked by Hydraulic or Steam-power; PUMPING, WINDING, and all other MINING MACHINERY supplied. STEEL specially adapted for Mining Purposes supplied at current prices.

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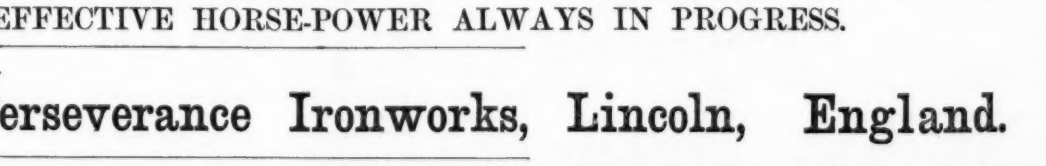

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THE DOTTED LINES SHOW THE ORDINARY SECTION, AND THE DARK GROUND THE IMPROVED SECTIONS.—A saving of at least 30 per cent. is effected by the great reduction in weight of material.—For price and particulars apply to—

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NOTICE.—These Sections are Registered.

Original Correspondence.

COAL IN NOVA SCOTIA—THE PICTOU COAL FIELD.—No. III.

SIR,—There is a formation of a basin on this area—that is, the seams having opposite dips, one dip being to the north-east, the other dipping south-east. It is on the north-east dip that all the company's mining operations have been carried on, and as far as I can discover only one small seam shows the north outcrop on this area, yet there are great advantages to be gained in the mining of coal by having a basin formed in a coal area like the basin in this area, which I shall revert to when I come to treat of questions and answers upon improvements.

My observations commence with 1866, although I understand that mining commenced on this area in 1827. The seams worked by the company on this area are the main or 38-ft. seam, and the deep or 24-ft. seam—the two largest seams of the district, but not composed of the best coal. According to tests which have been made of the coals of the different seams of the district, and the seams which are found underlying this area, proves the old adage—that good things are to be found in small parcels. Both of these large seams are composed of what are called good and bad coal, which when worked out and mixed together interfere with the marketable quality of the whole, and often cause complaints to be made by the consumer on account of the quantity of impure coal mixed with the good coal, yet when proper care is exercised in separating that which is bad from the good the coal has the reputation of being a very fine gas, steam, and iron-smelting coal, but it can never become a first-class domestic or steam coal, on account of the large amount of light ash which it leaves after combustion. Therefore it becomes necessary that this company should open out some of the better qualities of coal for domestic and steam purposes, so as to enable them to compete successfully for the domestic and steam trade of the country.

In 1866 there were three shafts in operation for raising coal—two upon the main seam and one upon the deep seam, also two shafts for pumping purposes—one on each seam. The amount of coal produced by the three shafts according to reports for 1866 was 222,437 tons, the greater portion of which was exported to the United States. There were employed for the production of the 222,437 tons of coal 340 men and 123 boys in the mine, and 228 men and 25 boys on the surface, also 98 horses in and about the mine. Also 12 engines for all kinds for hoisting coal, pumping water, and running coal to shipping point, &c. PRACTICAL MINER.

New Brunswick, Sept. 8.

BIRMINGHAM AND BLAKELEY HALL COLLIERY COMPANY.

SIR,—A meeting of the shareholders of this company was held, on Thursday, at the Midland Hotel, to take into consideration the question of raising more capital to work the mine, which is to a great extent opened, there being more than 1000 yards of gate-roading now driven out in the bed of coal known as the Thirty-feet, or Thick coal of South Staffordshire. Upwards of 20 shareholders only attended the meeting, who were informed the money left to work the property by the promoters (Messrs. L. F. Edwards, solicitor, London, and his friend Mr. Sheridan, M.P. for Dudley) had been expended, and that without a further advance of capital the directors could not go on. And the few shareholders present showing no disposition to advance the necessary funds to ensure successful results, it was resolved that proceedings should be taken for the purpose of winding up the company. It will be right to say that there was no complaint made respecting the value of the mine, but there was much whispering respecting the small amount left in the company by the promoters as working capital, and the apparent waste made of that little. The whole capital of the company—100,000*l.*—was raised on debentures at 10 per cent. The company's offices were in London up to the end of January. When all the capital was expended and debts incurred Mr. Carter, M.P. for Leeds, the first Chairman of the company until now, with Mr. Lee, of the firm of Whateley, Millward, Baldwin, and Lee, of Birmingham, projected an idea as to certain changes in the constitution of the company, which they set out as eminently calculated to promote the prosperity and enrich the bondholders, which was, as near as I can tell without having all the papers before me, as under:—1. That the bondholders should be called upon to exchange 10 per cent. bonds for 15 per cent. preference shares, such shares not to be paid off as the bonds were to have been—at the rate of 10,000*l.* per year—but to hold the property in perpetuity. (I forgot to say that Messrs. Edwards and Sheridan had a final reserve in the property to the extent of 120,000*l.* shares, upon which they did not pay anything, as soon as the 100,000*l.* bond had been paid. The solicitor to the company, Mr. Lee, and Mr. Carter, M.P., agreed that the old board of directors, consisting of Mr. Sheridan, M.P., Mr. Carter, M.P., Mr. L. F. Edwards, &c. (I call the old board) should resign (they had no money to go on), and a new board should be elected, and the offices removed to Colmore Row, Birmingham. Accordingly, on Feb. 1, a meeting of the bondholders who had agreed to exchange their bonds for preference shares met at the Queen's Hotel, Birmingham, and passed all the prepared resolutions, &c., considered then necessary, and elected a new board, consisting of—Mr. Carter, M.P. for Leeds; Mr. Crassair, Victoria Foundry, Leeds; Mr. John Shepperd, Leeds, tool maker; George McGawley, Leeds, contractor; Henry Hughs, Woodsetton House, Dudley, coalmaster; Reuben Plant, consulting mining engineer, near Stourbridge. When, in order to make the wheels go round well, an account was opened with Messrs. Brewer and Co., Leeds (very natural), as, judging from the number of Leeds gentlemen on the board, we must consider it a Leeds company. So far all looked well. Their engineer—Mr. Elijah Davies, of West Bromwich—was called in, and promised in a few weeks to draw a large quantity of coal, and by so doing raised 'great expectations amongst those present, which promises, sad to say, up to this time have not been realised. The new board did not work well; Mr. Plant went down the pits with Mr. Hughs (his Staffordshire co-director), and declared that the contractor was having nearly 30 per cent. more than ought to be given to get the coal, and although Mr. Plant (with the help of Mr. Hughs) did all in his power to reduce the excessive price they were giving, he was unable to reduce the price until June 5, when he, on behalf of the board, reduced the charter as under by letting the pit to a fresh contractor:—

	The old charter, loaded into boats.		New charter, loaded into boats.		Saving per ton.		Selling price in boats.	
	s.	d.	s.	d.	s.	d.	s.	d.
Best coal.....	6	2	3	11	2	3	16	0
Common coal...	6	2	3	7	2	7	12	0
Lamps.....	4	10	3	4	1	6	10	0
Slack	3	0	1	11	1	1	5	6

Mr. David Plant, who worked the Nine Locks Pit, Brierley Hill, for Lord Dudley, until it was put to stand, is the new contractor, and but for the break-down of the water-engine, and the giving way of the old winding-engine, there is not the least doubt the pits would have been producing a vast quantity of coal, and this application for working capital would not have taken place. There is a great profit after paying the charter, &c., as before shown. Of course there will be other charges—engineers, clerk, rates, taxes, directors, &c.—which will be met by a small sum per ton as soon as the colliery is got to work. No doubt your readers will ask—Why break up a company so near prosperity? Well, it is this, as far as I can learn. All the debenture holders did not exchange, and as those who did exchange did so on the faith that all would exchange, and as some 30,000*l.* refuse to do so, if money is to be borrowed or raised under these circumstances it must be as a second mortgage, which cannot be done; therefore the selfish few will upset the company, and drive all into the Court of Chancery, as those who have exchanged are not content, because they expected all to do so. Mr. Plant holds by far the largest interest in the company, and he said in Birmingham last Thursday, "that it is beyond doubt the best place in South Staffordshire," and when looking round the district, and comparing notes, it will be seen that as regards situation the colliery is 1s. per ton, at least, better situated than any other colliery of importance. The capital is 100,000*l.* Spon Lane Colliery Company capital is also 100,000*l.* Sandwell Park capital, on present colliery, we expect will much exceed 100,000*l.*

In conclusion, I am informed that if the whole of the Blakeley Hall bondholders were now to agree to exchange bonds for shares there is every reason to believe they will very soon feel they have acted wisely in their own interest, but if they hold out the colliery will be sold, and no doubt, now trade is bad, at a very low price, and the proceeds wasted in law, while the widow, the orphan, the poor, and aged who have invested in it can ill afford the inevitable loss and ruin which must result from a breaking up, and will have just cause to complain of the bondholders who hold out, and thus wantonly effect their ruin. PRO BONO PUBLICO.

Midland Hotel, Birmingham, Sept. 22.

THE COLLIERS' SLIDING SCALE.

SIR,—In a letter addressed to you, and inserted in the Journal of June 26, I argued the relation between colliers' wages and coal prices, and I proposed, as a simple plan to settle the hot dispute between the men and their employers, that the collier's daily wages should be computed at one-half (or nine-twentieths) of the selling price of coal at the pit, giving a table to illustrate the fitness of the scheme. Since then I have reconsidered the subject, and have found little to modify; I have, however, herein endeavoured, while renewing the examination, to construct the sliding scale so long desired, sufficiently extensive to meet any case likely to arise, and easy of application by the most ordinary ability. I have endeavoured that the said scale shall be based upon such a fair average of cost as would be accepted by masters and men, with a view to avoid the impertinent and unacceptable proposal of inspecting the master's books in each individual case to ascertain the relation between cost and sale prices. It is not surprising that masters should sternly and persistently refuse such inspection, and it is surprising that the men or their delegates should have ever dreamed of such an act, which, indeed, would afford no real solution to the vexed questions—"What wages ought the men to receive?" "Ought wages to vary with the market prices of coals, or with those of living, or are they fixed by principles independent of either, or may they be variable or capricious?"

If wages were to be changed without being subject to some notice, and unless that notice preceded the change by a sufficiently long period, it would be quite impossible for masters to make reliable calculations beforehand as to the cost price or as to contracts, whether of time, or of quantity, or of sale price; they would at any moment be liable, after having secured a fair bargain to which they would be bound, to be molested or arrested by the unjust, because sudden, demands of the men. Therefore, it is desirable that there should be periods for the revision of wages or prices, and convenience points to at least a year's duration of current rates, whether of day or piece work; three years' fixed rates would be far better. And not only ought the price per ton or by the day to be scaled, but also the quantity which the masters ought to expect for the stipulated rates. Thus, assuming for argument's sake that the day's rate of wages of a collier be 5s., let it be understood that he shall cut and fill (say) not less than 3 tons of coal in his day's work; or, if he work by the ton, he shall earn 1s. 8d. per ton, so that he shall at least return 3 tons, and earn his 5s. a day. If he cut more he shall be paid as by the piece, though he work by the day, as the colliery benefits by the extra output, but if he do less than the stipulated rate he shall be paid as by the piece, but a diminished rate—(say) 1s. 6d.—because the colliery suffers a loss by the lower output. This is evident, because as the men who tram, bank, and screen the coal, also the engineers, overlookers, and staff are paid the same whether the output be large or small, so in the latter case the cost per ton is increased without the possibility of adding to the market price, which is ruled not by the masters, but by their customers. This argument shows briefly, but sufficiently, that wages may not be capricious nor variable.

There are many cases in which incomes are fixed independent of any external circumstances, but in all cases where demand and supply are the regulating agents an income will vary according as the one or the other predominates. Eminent men in any career command high rewards; the commoner kinds of talent earn often bare subsistence, because they are so very abundant, and so easily cultivated. Do the working men suppose that their lot is free from the laws which govern the pay of every other labour than theirs? Do they believe that they can compel rising wages, when far higher talent than theirs submit to low rates? And are working men persuaded that their own labour is of so equal, so common a kind, that all of them should be paid alike, and that masters are never to be permitted to distinguish between the abilities of one man and another by a different rate of wages? The men know perfectly well that many among them have better skill than others, and who expect higher pay, and who deserve it. To attempt to control this natural inequality is foolish, because in vain; wicked, because undutiful to God, who gave us his talents to be employed, and not to be withheld. The masters have adopted a simple and natural mode of paying for superior talent—that is, by piece work; a system which leaves a labourer free to work, more or less, according to his disposition and ability, which are gauged by his actual earnings. The conclusion, therefore, appears to be that, quite apart from markets or cost of living, other principles fix the scale of wages, such as the competition of numbers, skill of better workmanship or of time, the encouraging prospect of better profits, all which principles appeal to the employer's judgment, apart from more obvious motives, when arranging with individual cases the rates of pay which will satisfy both.

The cost of living would seem at first sight to be a fair test of the rate of wages. If one could only be sure of what is the true estimate of this cost the test might have a chance of being applied, but there are hardly two men who can agree on this base. The temperament and habits, natural or acquired, of individuals vary so widely that while half the men of a district prove even under trade depression to be sober, quiet, and thrifty, enjoying comparative ease with their families, the other half is found to be discontented and poverty-stricken, squalid, and noisy, receiving not a penny's wages difference from their neighbours, who are enjoying so opposite a lot. How, then, seeing that the behaviour of men (treated all alike by their employers) is so totally different, is it possible to allege that a cure can be found in this or that rate of wages? A frugal disposition will provide enduring comfort to a man under a very low scale, while the highest wages will not enable an improvident man to obtain a week's food if he be not at work. If the bare cost of living be assumed, it might be shown that, on the whole, there has been no such great change of late times as to justify any great departure from old rates, nor has there been any special tax or burthen laid upon working men which other sections of the community do not pay. If in 1870-71 3s. 6d. a-day sufficed for good wages in a coal country, then in 1875 there can be shown no increase in rent, bread, clothing, &c., which could not be compared with some previous times; and even if, for the sake of argument, a 15 per cent. increase may have generally prevailed, we ought not to expect colliers to demand more than 4s., or an additional 6d., a-day now to cover the cost of living, unless we have to grant the necessity of an increase in luxurious, wasteful, or expensive habits of the working men and their families, which would be a sad tendency if it should prove to be the case. The only justification of higher wages in relation to the question of living would be by showing that the men are really harder worked than they have heretofore been used to be. But how can this be said in the face of well-known facts that, concomitant with higher pay, shorter hours of labour prevail, and less quantity of work per day is performed? It can hardly be reasoned, therefore, that the cost of living can be brought to regulate wages, seeing that working men themselves do not profit by the liberty they have to work longer time and greater quantity, and so materially increase their means of meeting the higher cost of living (if it be so), which is the pretended cry. In any case the cost of living in 1874–75, as compared with that of 1870–71, has not advanced to so high a degree as the rise in wages, or the demands of the men. The 3s. 6d. per day of 1870 might have become 4s. in 1875, on the hypothesis of an advance in food of 15 per cent., if such could be proved to exist; but wages have actually advanced from 40 to 70 per cent., that is, 5s. to 6s. per day—a rise out of all just proportion, and devouring every chance of profit to the employer; not being, moreover, authorised by a corresponding rise of wages in any other trade whatever, and being especially, in the colliers' case, out of character with the comparatively unskilled labour they do.

Now, as the sale of coals is the only source from which the master derives the means to pay wages, it would seem that some relation might be naturally established between the one and the other. It must be borne in mind that coals are sold at so much per ton, therefore whatever relation exists between the different elements of cost and the sales price must be referred to this tonnage standard. Colliers' wages especially are of this nature, because on them depend all the items of profit or loss, which, according as they afford a greater or less quantity of coal, augment or diminish. There are certain classes of items which, in a colliery, affect the cost price variously.

1.—Some are constant from year to year, and can only be reduced to so much per ton by dividing by the yearly output. These are (at the mine) the managers, clerks, overlookers, firemen, carpenters, blacksmiths, engineers, stokers, and wagons when on hire; also (at the general office) the secretary, clerks, office expenses, travelling, stationery, and other incidental charges.

2.—Another series of items varies directly per ton, such as royalties, plant, pitwood, repairs, agency, and petty cash for oil, powder, &c., at the mine.

3.—A third series of items is composed of wages to colliers proper, who cut coal, and all the labourers auxiliary thereto, such as fillers, trammers, bankers, screeners, and others, as well as men employed underground on special work in timbering, airways, drifts, &c.

4.—The fourth and last series is formed of the sum of the interest of such money as was devoted to the construction of every kind of work at the colliery, of borrowed money for like purposes, and of working capital kept constantly in hand for stocking the bank with coal, which, when sold, returns the outlay to the treasury of the colliery, and lastly, of an amortisation fund. J. B. HUNTINGTON.

[To be continued.]

"A DERBYSHIRE COLLIER."

SIR,—I have read Mr. Stirling letter on the above subject. Hallam is but one of an army of colliers who would all equally risk their lives in like cases. For instance, at the same accident Henry Warner, a lad of about 16 years, while the cage-floor was sloped at an angle of 45°, or thereabouts, seeing Sims (who afterwards died) hanging with his head and arms down the shaft, seized Sims in his arms and held him till succour came, while the only thing which saved him from being dragged down with the dying man was that his own ankle and knee were held as in a vice between the cage and the shaft side, and he was in such excruciating agony as can well be imagined.

Could not some special subscriptions be intrusted to the Royal Humane Society as a Medal Fund for Colliers who thus save life at the imminent risk of their own? Such cases are of daily occurrence, and merit rewards of honour as much as those in which the Humane Society presents medals, or the Victoria Cross itself is awarded.

THE RECTOR OF THE PARISH IN WHICH
Sept. 17. —— THE ACCIDENT OCCURRED.

MINING IN QUEENSLAND.

SIR,—Since my last mining matters in this colony have been stationary. Gold in the North most active and successful: this present time is the very middle of the busy season; all the machines are at full work, the yield invariably good, the alluvial diggings yielding steady palpable returns, the "escorts" arriving at the several shipping ports heavily laden with the precious metal. So far the Chinamen have kept quiet, but as they are still arriving in shiploads the "Heathen Chinee" is getting more and more cheeky. The first thing they do is to arm themselves, and have thereby cleared out the old "Brummagem' stock at a very handsome profit to many of our storekeeps. When these "trusty" weapons come to be used I would certainly select the front as the safest place to be in. I trust they will keep quiet, as the diggers will, if they are started, make short work of poor John, and now that the natives have taken a liking to them in a cooked state their case would be sad indeed. In copper mining there is no change. There are several splendid copper mines that can be purchased out-and-out for 10,000*l.* to 20,000*l.*, in full working order, and having twice the purchase money in several instances of ore in sight.

In tin mining new ground is being opened up almost daily; increased activity prevails all over the field, but everyone is holding. I cannot do better than give your readers an extract from the Stanthorpe paper of June 26, contributed by that paper's "Harding Yard Creek" correspondent. He says:—

Our neighbours of the Mole Tableland have commenced to see how this road will work to forward tin to Sydney. Last week two drays passed with some 7 tons odd on, *en route* for Warwick. Should carriage be, as I hear, only 4*l.* per ton, it can be delivered in Sydney by this route for about 8*l.* 10s. per ton—an important difference compared with the cost of transit by way of Grafton, which is from 10*l.* to 13*l.* per ton. During the past fortnight several lots of ore have changed hands, varying in price from 38*l.* to 40*l.* 10s. per ton. An immense lot is still stored with the expectation of better prices.

In conclusion, I may tell you there was only 357 t. 13 c. 0 qr. 11 lbs. of tin forwarded from the Warwick Railway Terminus during the month of May, made up of stream tin 351 t. 11 c. 3 qrs. 5 lbs., and ingots 6 t. 1 c. 1 qr. 6 lbs., showing a slight increase in ingots, but a falling off of 30 tons stream tin on the previous month (April), and a further falling off of 133 tons on the same month last year. The total falling off of receipts at Warwick for the first five months of this year being 400 tons less than the first five months of 1874. There have been two discoveries of stream tin made since my last in this colony, one is within 6 miles of the railway line, and 50 miles from port, and my informant says showing very rich. The other is 80 to 100 miles south of the Palmer, a likely country.

A splendid discovery of cinnabar has lately been made in the Western district, very rich and extensive; also in the same district, but much nearer this port, an extensive deposit of rock salt has been discovered. This last is of much more importance to this colony; in time it will, in fact, make us independent of England of the most necessary article she has to supply us. RESIDENT.

Brisbane, July 2.

MINING IN QUEENSLAND.

SIR,—The receipts of tin at the Warwick Terminus during the month of June was—stream tin, 329 tons 15 cwt. 3 qrs. 1 lb.; ingots, 4 t. 13 c. 3 qrs. 16 lbs.: total, 334 t. 9 c. 2 qrs. 7 lbs., showing a decrease of 25 tons on the previous month, and a decrease of 200 tons on the same month (June) last year.

The receipts for the quarter ended June 30 last was—stream tin, 1063 tons 13 cwts. 1 qr. 9 lbs.; ingots, 13 t. 18 c. 2. qrs. 23 lbs.: total, 1077 t. 12 c. 2 qrs. 2 lbs., being within a ton of the same quantity as received the previous, or first quarter of this year; and showing a decrease of 378 tons on the second quarter of 1874. The receipts for the half-year ended June 30 last was—stream tin, 2134 tons 5 c. 3 qrs. 17 lbs.; ingots, 22 t. 5 c. 0 qr. 23 lbs.: total, 2156 tons 11 c. 2 qrs. 10 lbs., showing a decrease of 673 tons on the previous half-year, and a decrease of 617 tons when compared with the first half of 1874. Against this falling off the stock of stream tin held on the several claims is reported as very large and accumulating, and I expect during the same time the receipts at Murrurundi will be in excess, and the receipts at Grafton somewhat less, the particulars of which I hope to give you in my next.

The exports of tin from the Port of Brisbane for the half-year ended June 30 last were as follow:—

To Great Britain.....	Tons	219½ ingots, valued at	£18,720
To New South Wales.....		¼	25
To Singapore		1-20	5
Total	Tons	220	£18,750
To New South Wales		1716¼ stream tin	89,210
Gross total	Tons	1936¾	£107,960

Comparing the past half-year with the first half of 1874, these figures show a decrease of 297 tons ingots and 564 tons of stream tin. The gross decrease in the declared value being 78,186*l.* These figures further show that the whole of the tin smelted in this colony is now shipped direct to London, while the whole of the stream tin exported goes to Sydney to be smelted. Of the 2134 tons stream

tin forwarded by rail from the Warwick Terminus during the half-year, 1716¼ tons were forwarded direct to Sydney, while the balance, 418 tons, barely one-fifth, was smelted in Brisbane. Of the 220 tons ingot tin shipped to London 22¼ tons were smelted on the field, and the balance, 197¾ tons, were the production of the Bulimbo Works, the produce of the 418 tons stream tin referred to above, and that in the ships' bottoms which are now loading.

The cash loss in the half-year of 78,000*l.* in this one item of export is a serious matter to the colony at large; yet, notwithstanding the enormous fall in price, it is evident from the figures quoted above that so far as this colony is concerned there has been a positive increase in the production of tin during the past half-year.

The total quantity of tin smelted on the tin fields is represented by the 22 tons ingots sent down during the half-year, being only slightly in excess of the quantity forwarded during the previous half-year, and as will be seen by my returns each month past some comes down every month, it is evident that if the whole is even the production of one furnace, the smelting on the field, although carried on now for over 12 months, has not been as yet successful.

In my next I hope to be able to give you the gross receipts for the half-year, and the gross exports to London. From this side the London quotations are watched very anxiously. A rise of 10*l.* in the price of ingot tin would brighten up the miners considerably, but from the extensive discoveries of rich leads that of late have been found all over the district, and the experience gained by the tin washers in cheap and systematic working, I do not think that another fall of 10*l.* in the price of tin in London would materially affect the Australian supply.

I am sorry I cannot give your Cornwall correspondent more encouraging news. If I could only write you the five little words, "Our tin has run out," what joy there would be round his camp, but I can only advise him to follow "Mahomet's" example—*i.e.*, come to the tin, &c.

In copper I have little to report. It is said that the Peak Downs Mine at present holds over 4000 tons of rich ore at grass, and over 800 tons pure copper in cakes in store, which cannot be carted to port owing to the continued wet weather. The shares of this company are now quoted in Sydney at 9s. 6d. The best buying I know; they are cheap at 30s., even with copper at its present price.

In gold I am glad to have to report that Gympie is again attracting attention, owing to some very rich finds in the old, and in some instances abandoned, reefs. The Palmer is also keeping up its prestige. The "Heathen Chinee" are very quiet, carefully keeping to the ground that has been worked out and abandoned by the European diggers. The crushings at Charters Towers and Ravenswood have of late been very good, reaching in many instances 10 ozs. to the ton of quartz crushed.—*Brisbane, July* 16. RESIDENT.

COPPER MINING ON LAKE SUPERIOR.

SIR,—Last week I sent you the amount of assessments called in; the dividends declared; striking a balance of $2,000,000 against our Lake Superior Mines as a district. To offset this balance I intend, if you deem it of interest, to send you the amount and kind of stamping and washing machinery we have, hoisting and pumping engines, saw-mills and other improvements included—paid for out of the figures sent you. After I get through with such I will endeavour to lay before your readers the condition of some of our mines since the year 1872. In speaking of the amount and kind of stamping power we have, I will endeavour at the same time to give you the amount, in tons, of rock each and all stamps will stamp and wash in a given time. In the meantime, should any of your readers feel desirous of putting any questions which it is in my power to answer, I shall be happy to reply to their letters through the Journal.

Portage Lake, Aug. 30. A MINER.

CHONTALES AND JAVALI MINES.

SIR,—Reading the Journal of May 29 and June 5 and 12, I find a comparison made between these two mines, both situated in the Republic of Nicaragua, and which place few people in England are much acquainted with. The comparison has been drawn evidently by someone who may, as a shareholder of Chontales, know something about his own company, but very little about Javali, which is plainly to be seen by his statements. In my opinion a true comparison can only be drawn by those who have visited both properties in their present state, and not by information obtained from persons interested, directly or indirectly, in either company.

With regard to the enormous extent of the Chontales mines it is very true; they have several, which were purchased from the original Chontales Gold and Silver Mining Company (Limited), and everyone who has read that company's reports, and seen the plans, must be aware that most of them were nearly worked out before the present Chontales Consolidated Company (Limited) obtained possession of them—say, for example, Trinidad, Consuele, San Antonio, Santo Domingo, San Benito, &c. Not so with the Javali, which has only one mine, with a lode extending 1000 Spanish yards, and of an average width of 10 yards, with rich auriferous surface deposits, which give a very good yield, and are called by the natives "Manta." These are only to be found to any large extent in two mines in these districts—say, San Juan and Javali.

As to the veins which may, and probably do, exist through the different properties of these mines, the mining laws of the country state plainly enough that they belong to those who may denounce them first, and not to the owners of the land. With respect to the extent of forest lands of said companies, Chontales has 2130 acres and Javali 4620 acres, the latter well stocked with timber, not having used much, but the former have consumed a great quantity for years past, and consequently have to go a great distance to obtain good timber, either for fuel or mining purposes.

Touching the machinery, it is a perfect farce to compare that of Chontales with Javali, although it may have cost three times the amount. But I would ask in what condition is it now, and what is there really available advantageously? Chontales has 36 stamp-heads, weighing 5 cwt. each, a Blake's stone crusher, and one arrastra; the stamps have each an 8-in. lift, and perform about 70 drops per minute. Javali has 30 stamp-heads, weighing 650 lb. each, a Blake's stone crusher, and five amalgamating pans of the most improved principle—say, Wheeler's and Varney's. The stamps have 10-in. lift, and perform about 75 drops per minute, are of the best improved Californian system, with high mortar boxes, so as to amalgamate in them when the quartz is of a quality to require it. Whereas Chontales has changed in a period of eight years four different times the system of stamps, commencing with the old-fashioned square, and lastly with the *new pneumatic*, which latter up to the present time have not been proved. The Javali crushes the quartz to a finer extent than the Chontales, which is the very reason the former does not crush so many tons of ore, but gets a better yield. At the Javali the whole of the machinery is erected in the most substantial manner, the proof of which is that the first 10 stamps, after running seven years (say, since 1868), have never settled or shifted the sixteenth part of an inch; but those of the Chontales, if the present manager be asked no doubt he will inform how often during his short administration he has had to raise, repair mortar boxes, and make new foundations. Javali has a magnificent water-power for about eight months in the year, and only requires steam for the other four months; whilst Chontales is compelled to employ steam as soon as the water begins to diminish in the stream, which greatly increases the reduction expenses. The buildings of the Javali are in thorough good repair, and substantially built, so as to last, and no officer or workmen can possibly complain of their not being tenantable; whereas should the medical officer attached to both companies (who has his quarters in one of the Chontales houses) be asked his opinion, he can afford every information, without being biassed in favour of either company.

It seems to me a very strange thing that the Chontales Company (for want of labores) cannot supply all the machinery with payable ore, but it appears it does so with inferior to the extent of about 1700 tons per month. The present manager of Chontales stated in one of his reports that he could easily make large profits provided he took the richer portions of the mines. I cannot see the great disadvantage to the company by doing so, if even for only a single month, to show the fact by actual results obtained. If the mines are of such a large extent a single month's trial could not damage them, but, on the contrary, would increase the confidence of the shareholders. Comparing the results of the Chontales obtained in former years with those of the last two, they are about 50 per cent. less, and the average yield of quartz fallen off from 7 to 3¼ dwts. per ton, therefore most likely the eyes of the mines have been picked out in former times. This is not the case with the Javali, as from 1871 up to the present time the quartz has always been improving; the good results have not sprung up lately, but were obtained for the last four years, but as until very lately it had no steam power, therefore the dry season consumed the profits made in the wet. Some six or seven years ago the Chontales were the only Nicaraguan mines mentioned in the Journal, from the fact that they had arranged for their quotation on the Stock Exchange; but years have effected a great change, and now Javali seems to draw the attention of capitalists purely for its own merits. The Chontales Company the people here look upon with disgust, as they very justly say the enormous capital which has been lavished on the mines since 1865, without any advantage to the shareholders, has totally ruined the reputation of their country as a gold-bearing district; and the only hope they have left is that the Javali will ere long be able to prove their right character, and place themselves in the position they richly deserve.

The falling off in the remittances of the Javali lately was entirely due to the dry season, but now as the wet season has already commenced, no doubt large returns will be made, and continue during all seasons of the year, as in about two or three months a powerful steam-engine will be erected at the works.

The Chontales Company having for eight years past two engines of 25-horse power each, could never suffer by the dry season; and I am astonished to see in the Journal of June 12 that the shareholder of the Chontales puts his faith in the wet season, forgetting that in all former years they always made their best remittances in the dry season, because they can keep up the supply better, and do not suffer from the floods and caving in of their mines. (See report, 1874.) With regard to the other points mentioned, as extent of Pavon Mine, financial position of both the companies, pneumatic stamps, directors' fees, &c., I will reserve these for another occasion, but I should recommend the shareholder of Chontales to take a trip to Nicaragua, visit both establishments, and then judge for himself, and no doubt he will on his return, if he wishes to recover part of his losses in Chontales sell out and purchase Javali shares.

Nicaragua, Aug. A VISITOR TO BOTH THE MINES.

RICHMOND CONSOLIDATED MINING COMPANY.

SIR,—Since addressing you in reference to the slanderous article which appeared in the *Railway News* of Sept. 11, on the subject of the Richmond Consolidated Mining Company, I have noticed the admission of that journal in its issue of Sept. 18 that it had "been misled in some important particulars, and, as if conscience stricken because of the injustice of which it has been guilty, it professes to make the *amende honorable* by expressing its regret" to find that anything in the article should have been liable to be taken as reflecting on the character of the members of the board, since no such construction was intended."

If, as is alleged, no such construction was intended, I would be permitted to ask what was the object and intention of the article in question? It appears to me, as it undoubtedly must to every dispassionate reader, that the plain English of the article is that it is neither more nor less than a series of imputations and reflections on the character and conduct of the board, and of gross misrepresentations of the actual condition of the affairs of the company. I think, therefore, that it would have shown more manliness of character and honesty of purpose on the part of the *Railway News* if in its expression of regret the retraction of the false and libellous statements so unwarrantably brought against the board had been made with less qualification and reserve. The language employed was so plain and unambiguous that it could not by possibility admit of a different construction from that conveyed to the mind of every reader, and it is puerile in the extreme now to say that "no such construction was intended." And although the board to whom is entrusted the management of the affairs of the company consists of men who can afford to treat with contempt the calumnious uttering such as those of the *Railway News*, their duty to society, as well as the vindication of their own conduct and character, demands that such unfounded and libellous statements should not be suffered to pass with impunity.—*Sept.* 21. VINDEX.

CAPE COPPER MINING COMPANY.

SIR,—It may be interesting to the shareholders to know that the export of copper ore from the Cape, as officially stated in the Government returns, amounted in the month then past to over 1500 tons: this in the 12 months would make 18,000 tons, or double the amount exported in any previous year. Why, under these circumstances, the directors after some delay only declare the usual dividend is puzzling.—*City, Sept.* 23. R. S. TREDGOLD.

PROPOSED MINERALOGICAL SOCIETY.

SIR,—The Mineralogical Society of Great Britain and Ireland is now fairly established; its objects being the following:—

To simplify mineralogical nomenclature.

To determine and define doubtful mineral species.

To study the *paragenesis* of minerals.

To record instances and modes of pseudomorphism, with their accompanying phenomena.

To measure, determine, and illustrate forms of crystallisation—especially the irregularities and peculiarities of particular planes, or of crystals from particular localities.

To discuss systems of classification, and to establish a natural system.

To collect, record, and digest facts and statistics relating to economic mineralogy.

To systematise petrology.

To promote the exchange of specimens; and, generally, to advance the science of mineralogy.

Any readers of the *Mining Journal* who may be desirous of joining the society, or of making enquiries in relation thereto, may communicate either with Mr. T. A. Readwin, F.G.S., of Mersey Villa, Tuebrook, near Liverpool, or to J. H. COLLINS.

57, *Lemon-street, Truro, Sept.* 18.

MINERS' ASSOCIATION OF CORNWALL AND DEVON.

SIR,—The prizes offered by Mr. Basset, through the Miners' Association, are not quite accurately reported in the *Mining Journal* of last week; I may, therefore, state by way of correction that in order to stimulate research, experiment, and invention, and to promote the advancement of mining enterprise in Cornwall and Devon, Mr. G. L. Basset, of Tehidy, offers prizes, under the following conditions:—

1. For the discovery of a new mineral, in Cornwall or Devon, which is deemed likely to become commercially valuable—a prize of 50*l.* An accurate analysis and a description of the leading physical properties and distinguishing characteristics of the mineral to be given, specimens to be handed to the committee, and the locality and mode of occurrence to be distinctly described.

2. For the invention of a method, mechanical or chemical, of making marketable, with commercial advantage, ores or minerals produced in Cornwall or Devon, and hitherto regarded as worthless, or of little value. The method to be clearly described, and specimens of the product in its several stages to be handed to the committee; or

For the discovery of some new application of a mineral substance already known to occur in Cornwall or Devon, either by itself or in combination, to some useful purpose, so as to render it of marketable value, or materially to enhance its value if already marketable to some extent—a prize of 100*l.*

The prizes are to be awarded at the discretion and according to the judgment of a committee, consisting of the President and Hon. Sec. of the Miners' Association, and some other gentlemen to be nominated by Mr. Basset.

I venture to ask you to make these conditions known to your readers next week.—*Truro, Sept.* 18. J. H. COLLINS, Hon. Sec.

THE COMPOUND DIFFERENTIAL PUMPING-ENGINE, AND THE ROYAL CORNWALL POLYTECHNIC SOCIETY.

SIR,—The Royal Polytechnic Society of Cornwall is professedly an institution for the encouragement of science and invention, more especially in those things which benefit mining, and one would have thought that as it is so intimately connected with the Mining School it would readily encourage any invention that would cheapen in any way the working of mines. Under these impressions I was induced to send a working model of my Compound Differential Engine to the Exhibition, which has just been held, and I considered myself much insulted at receiving a second silver medal award. If there had been anything in the Exhibition that even pretended to a greater importance to the mining interest I would have humbly submitted to the decision of the judges, but as there was not I submit that it was very unfair to go out of the way to get rid of the first silver medals, and award them to things which could not in the least influence Cornish mining.

Some of the judges were makers of Cornish engines, and one or two of them would not take the trouble to examine the Differential, remarking that there was nothing like the Cornish engine. There is an old proverb describing the effect of convincing a man against his will, but if a man will not listen how are you to convince him? I had no opportunity of advocating my claims at the meeting; I was, however, gratified to hear the President (Mr. Pendarves Vivian, M.P.) attach so much importance to the question of economy, contending that it was the only hope for Cornish mines in the future. The cost of providing plant to drain our mines, and the constant expenditure in fuel and maintenance, are items of very considerable magnitude, and it is only by collectively considering them that we can arrive at a proper basis of economy. It is self-evident that if two engines will work with an equal economy of fuel, and one of the engines costs 50 per cent. less than the other, and requires less expenditure in maintenance, then the less costly engine must be, taking it all in all, the most economical. I claim for the Compound Differential Engine as advantages over the Cornish engine—

1. The first cost of engine and buildings taken together is 50 per cent. less than that of the Cornish engine.
2. It will give a higher duty under similar conditions of working.
3. It requires less costly pitwork.
4. It will give a high duty and work with a high degree of expansion under conditions of working which will not admit of any appreciable amount of expansion in the Cornish engine.
5. It saves the pumpwork from the heavy shocks and breakages arising from taking air, or, as it is termed in Cornwall, "working in fork." There is no necessity for such precautions as that of running down water to keep the plungers charged solid.
6. It is a simpler machine, has fewer parts, every detail is on our floor line, and more readily accessible.

I have a Differential Engine working bucket lifts at a speed of 120 ft. per minute, and realising the benefits of a sevenfold expansion. A Cornish engine could not realise any expansion worth naming under such conditions. I need not demonstrate the fact that, *ceteris paribus*, the higher the degree of expansion the greater the economy of fuel. This fact has been always acknowledged since the days of Watt, with certain practical limitations. Cornish engineers have recognised this fact in their endeavours to raise the steam pressure and increase the expansion; practice has, however, proved that in single cylinder the limit to expansion working is soon arrived at, and although on a trial with ponderous pitwork it is possible to get a high duty by expanding beyond the nominal limit, yet for constant work "the candle becomes too costly for the game." There is the great risk of breakages arising from the immense strain thrown on the pitwork—four times as great as that produced by the Differential Engine working with the same degree of expansion. It may be said that Compound engines have been used in Cornwall. I admit they have, and further, although in a crude and expensive form, did very high duty. The compound engine, in spite of opposition, has now been so largely adopted in steamships, and with such good results that its economy over single-cylinder engines is established. I am afraid that I am making this letter a very long one, I will, therefore, close it with one or two observations on the Differential gear.

I have put this gear to a Cornish engine at Chesterfield. Before the gear was applied the pitwork was subject to very heavy shocks, and the engine worked on the verge of a breakdown; now it works quietly, and the shocks are entirely obviated. At Fence Houses a Compound Differential engine has been employed (with from four to eightfold expansion) in sinking with two 18-in. lifts, and the sinkers say that they "never worked with such quiet pitwork." My firm is now engaged in replacing several Cornish engines with Compound Differential engines, and this fact encourages me in the hope that the Polytechnic Society of Cornwall may at a future date be induced to open its eyes to the principles of steam-engine economy. It does seem anomalous that the President should raise the cry, We want economy, and that the jurors should close their eyes, and say in effect—We are all right as we are.

Leeds, Sept. 21. HENRY DAVEY, M.I.M.E., F.G.S.

CORNISH STEAM-ENGINES.

SIR,—In an article on the duty of Cornish steam-engines in last Saturday's Journal you have quoted the high duty reached by Taylor's engine, United Mines, in 1842, to show the apparent retrogression in the Cornish engine since that period. This comparison is now become of frequent occurrence, but no notice whatever seems to be taken of the different conditions under which Cornish engines, as a rule, are now worked and at that period, or of the age of the engines from which the present average is taken.

A glance at the duty paper of the former period will show that the engine-shafts were then nearly all perpendicular (at the present day we have *one*, against *seventeen* in 1842), and were more than an average duty was reached the engines were moderately loaded, so that the friction was reduced to a minimum, and enabled a high rate of expansion to be carried out. The very opposite is the case in the present day, owing to the system of mining pursued of late years—sinking the shafts on the course of the lodes for sufficient and probably satisfactory reasons, but at an increased consumption of coal cannot be questioned; their course is irregular, friction of necessity very considerably increased, and a high rate of expansion become impossible. Compare, for example, Taylor's in 1842, and Pelly's, Crenver and Abraham, in 1875. Taylor's had a perpendicular shaft 200 fms. deep, with a load of 12 lbs. per square inch, working five strokes per minute, and a new machine (Pelly's) has only 164 fms. perpendicular, 125 fms. diagonal on the course of the lode, loaded 25 lbs. per square inch, and worked upwards of 20 years. The conditions are so dissimilar that no comparison can be drawn; the friction of the latter is considerably increased, and a low rate of expansion can only be reached; that there should be more than 50 per cent. difference in the duty under these circumstances cannot, therefore, be wondered at. But it must not be supposed that everything went smooth with Taylor's engine; this high rate of expansion resulted in a serious breakage, and from that day to this such a rate of expansion has not been attempted, neither do I think any engineer would recommend it.

This is not the only reason that brings down the average. The average of the present day is in three instances made up of engines at work in 1842—Botallack, Carn Brea, and East Pool; their average duty in 1842 was 58 mills, now 39, but their average lode has increased from 12 to 17 lbs. per square inch; they have 140 fms. additional flat-rods, and this after 33 years' additional wear and tear. Taylor's engine was a new one, working under exceptionally favourable circumstances, but the average of the present day include, the above-named engines (one of them has been at work 53 years), and others working under the conditions named.

Let those who condemn the Cornish engine recollect that the pre-

sent average duty of Cornish engines includes amongst them one which has been at work continuously on one shaft upwards of *fifty* years.—*Redruth, Sept.* 21. ——— ENGINEER.

ECONOMICAL MINING.

SIR,—The able article on this subject in last week's Journal suggests the desirability of much further information on the various topics discussed. Are there any 100 pumping engines to be found in any one known district doing equal duty to a similar number in Cornwall, and if so where? At what depths are they pumping water from, and under what conditions? If the best miners have left Cornwall, where can we find the fruits of their economy?

For comparison, I think the average duty of all engines reported on in each year should be taken, and not the highest in one case and the average in another. A far better test, however, is to compare the total quantities of coal, timber, tallow, and oil used in those united mines for the 12 months referred to, with the quantities of similar stores consumed in a similar period by an equal number of engines doing an equal amount of work in the present day. A comparison of this sort would possibly very materially alter the appearance of things, just as your capital article on coal consumption, or rather production, did a short time since.

Again, I think you are hard on our engineers in so ignoring their services. It must not be supposed that because Mr. Hocking, (according to his published letter) has chosen to do his work at his own house, and write notices to the agents, instead of spending some of his time in the different engine-houses under his control, and instructing the engineman how to use the fuel economically, that all the engineers are so remiss. From my experience of several of them they are not so, but are anxious to work the engines as economically as possible, and do their best to accomplish it.

One of the most gigantic difficulties the mine adventurer had to contend with is that of (in many cases excessive) dues; this, in addition to the shameful injustice of the mines and the rating Acts in exonerating entirely the lords from any liability on account of the fencing old shafts (never used by the present generation), from which they have derived their thousands of pounds, and also in relieving them entirely from the new rates levied on all mines, is enough to cripple any industry so heavily weighted as mining has been lately. And yet Mr. Basset, and those who so extol his actions, seem to ignore those late impositions on mining industry. When the new rating Act was passing through Parliament we were told that lords and miners would have to pay a moiety each of the rates newly imposed, but, Jesuit like, our legislators introduced a few words so as to completely exonerate the lords. A greater piece of injustice and deception was never perpetrated. It is all very well for the lords to offer prizes when the poor adventurer has to sacrific his thousands to make the experiments, while at the same time the lords are reaping additional profit without the shadow of risk. Those things must come to the front. Dues should be from profits only, exactly as rent is from land, there can be no injustice in this, then they would to a certain extent bear a portion of the costs of those experiments, as they should do. Z.

MINING PROGRESS IN CORNWALL.

SIR,—I was surprised at finding a leading article in last Saturday's Journal containing so unqualified a condemnation of the men employed in the management of mines in Cornwall. If so severe a censure were at all deserved why has so ignorant and incompetent a class of men been allowed for so long a period to usurp the management of Cornish mines? The writer says—

"It would appear that a class of writing managers have taken the place of the practical managers of former years, and that these writing managers have not followed the excellent example of the Germans and Americans by acquiring technical knowledge likely to be useful to them in their business. Yet that Cornishmen are not without the constitution and character which make good miners is shown by the high positions they attain in foreign countries, but the general aversion to progress which pervades the county seems to deprive Cornwall of her best miners, and leave none but the incompetent and uneducated to manage Cornish mines."

Can language convey more sweeping and general condemnation? According to this the Cornishmen can only become good miners by going abroad, and learning their business from Germans and Americans. All those left at home are uneducated and incompetent. It is no wonder, then, that Cornish mines are not more profitable, for if this be true we have a solution of the whole difficulty. The great depth of our mines, their general comparative low value when compared to mines in new, and consequently richer, countries, the large quantities of water to be pumped from great depths, all these are of no account. Would it not be advantageous under these circumstances that a few Germans or Americans should be imported, in order to relieve the present incompetent class of mine managers from duties which ought to be irksome to them? How is it that Mr. Basset, whom the writer justly lauds, has thought proper to select one of these very men you so stigmatise as his mineral agent? One would have thought that for so important a post a German or an American should have been chosen. I have been employed in metalliferous mines for 40 years, 20 of these years having been devoted to the management of Cornish mines, and during the greater part of this time have been an occasional contributer to the Journal, consequently am one of the "writing managers" you are so heavy on. My contributions to the Journal, both anonymous and otherwise, have sometimes been favourably noticed by you, as well as the manner in which I have carried out the mines under my control. I have contrived to discover and bring to market pretty large quantitses of mineral, sometimes at a profit, and sometimes from very poor mines. Please do not assume that I am going to claim any singular ability, for there are many in similar positions, some having done better and others worse, and probably some of them who have done worse may have been the better men, for the best man who ever went under the surface of the earth cannot see a course of ore very far ahead. I have seen Germans, Americans, French, Spaniards, Hindoos, and men from other nationalities come here to receive mining instruction from the very class so contemned, and they have received it too, and now we are told that we are behind all the world, unpractical, writing without knowledge, uneducated, and incompetent.

Perhaps, Sir, you will allow me, as one of the "writing managers," to bring forward some of my objections to the writer's very sweeping condemnation, and will give it a place in next week's Journal. The writer of the article in question may not be particularly pleased at seeing "writing managers" questioning his assertions, and objecting to his diction, but I have hitherto always contrived to defend myself, and shall somehow defend myself still, whoever may attack. Is it not singular that Mr. Basset should have drawn his inspiration from one of the class described as ignorant and incompetent? This gentleman certainly did not regard with so much contempt the miners employed in the management of Cornish mines, or he would not have trusted one of them to furnish him the statistics for his speech at the Polytechnic Hall. Probably the writer may not have taken the trouble to examine the different conditions under which many of the engines work now than formerly. I find that the engine referred to at the United Mines as having given such a very high duty so many years ago, worked with a very light load on a perpendicular shaft, whereas many of the engines now at work are not only heavier loaded, from the increasing depth of the mines, but have to work through inclined shafts, where it is quite impossible to use steam so expansively, and therefore impossible to get the same amount of duty from them. This is one reason why the apparent difference in duty performed is so great, but this is not all. The writer has taken the highest duty ever reached, and compared the same with the average duty now obtained, whereas a fair comparison would have been only shown by taking the average duty of the two periods, which is the course Mr. Basset adopted. If we enquire under what circumstances this highest duty was obtained, we shall find that it was not only on a perpendicular shaft, where an exceptional rate of expansion could be brought into play, but that this exceptional rate of expansion was continued until the whole thing smashed. We shall scarcely find that a president, engineer, or manager will be inclined to imitate such an example, even when they have a perpendicular shaft to work on, which is very rarely the case. In order to understand "Lean's Engine Reporter," and to apply its teaching aright, you must note the increased weight attached to the different engines consequent on increased depths, also estimate the friction arising from working underlay rods, &c., neither of which you have attempted doing. Possibly one of our engineers may notice the article, and enlighten the writer on this important subject. It is scarcely wise for me to write more than is barely necessary, after the stigma he has attempted to fix on all managers of Cornish mines who attempt to communicate their thoughts to the Journal.

I may, however, not be considered out of due order even according to what we may conceive as the exclusive idea of the writer of the leading article, when treating of the economy of working rocks. The ignorance which prevails among men who are not miners, both in and out of the county, on this subject is sufficiently amusing. Why has machine boring, successful everywhere else, not been successfully applied in Cornwall and Devon? This has been attributed to aversion to progress, prejudice, ignorance—in fact, to almost every imaginable impulse, while the real cause has never been so much as thought on by these critics. The masterly manner in which the miners of Cornwall and Devon can deal with the hardest rocks is the true cause of the difficulty experienced in introducing any rock-drill. No engineer has yet succeeded in working rock nearly as cheap as the Cornish miners can do it, and until that point has been attained there is an obstacle to the introduction of such machinery, to which every sane man will attach its proper importance. In districts and countries where the miner's labour can command a much higher wage in consequence of the greater productiveness of the mines, these rock-drills have a far greater chance of being successfully introduced, and the same may be said in those district where skilled miners are not so readily obtained, but while we can work the hardest rock for one-third or one-half the cost by hand labour than machine drills can do it, it will be difficult to convince the men who have to find the money that it is to their advantage to incur an excessive outlay to achieve a doubtful result. Let those who are so pressing in this matter try to assist us in finding the money to do it, and there will be no objection in trying rock-drills or anything else. It is the hope of the managers of Cornish mines, with all their incompetency and lack of education, that some advantages will yet arise from their successful introduction.

But until more decided results shall have been achieved than any rock-drill has yet achieved, the skill which enables the Cornish miner to deal with the hardest rocks—much harder than any rock-drill has yet successfully operated on—more economically than any other miner can, will be an obstacle against its introduction, except in a few particular places, and under exceptionally favourable circumstances, into this county.

The writer says—"Mr. Basset feels that if less attention be given to mystic agencies and impossible chemical theories, and more to really practical matters, the position of Cornish mining generally will be improved." Now, Mr. Basset did not give expression to any such feeling, and whence could the writer have drawn the idea which led to that remark? I do not like to say that he has been drawing from the purest realms of fancy in this matter, but would thank him to point out any expression of his which can be construed into giving the shadow of such an idea. Mr. Basset, judged by his public acts, is better acquainted with the miners of every rank by whom he is surrounded than to entertain any such feeling towards any class of them; and if the writer will notice carefully what he did say he will find that he spoke as a practical man to practical men, and not in the dictatorial tone assumed in the leading article.

Redruth, Sept. 22. ——— A CORNISH MINER.

OLD MINE BURROWS.

SIR,—A controversy, which is now revived, took place in the *Mining Journal* some time since with regard to the contents of old burrows in the West of England, and it was confidently stated that they contained silver and other products in such quantities that, if extracted by a certain process, a revolution would be caused in mining. Now, as this is a question which intimately concerns the mining public, it may be well to enquire what is meant by old burrows containing certain specified quantities per ton of stuff? From the tenour of the letters which have appeared it would seem that the whole and sole contents of these old heaps of stuff are capable of yielding valuable returns of silver and copper per ton. It is, however, to be feared that any investment made under this supposition can only be attended with one result.

To all men of experience it is well known that a large proportion of the best burrows that can be found is entirely worthless, and that the remainder requires much time and labour in the recovery.

The Beeralston burrows are said to contain 100,000 tons of stuff, thrown away, of the value of something like a quarter of a million sterling, but as this statement rests on the results of assays made by a local amateur, who promulgated a still more startling report with regard to the Queen Mine, which had its being in the same neighbourhood, your practical readers may be pardoned if they look upon the present representation with some considerable degree of doubt and misgiving.—*Sept.* 22. ——— INDEX.

THE DIVINING ROD.

SIR,—There has been a very lengthened and learned discussion in your paper upon a very small and simple thing, called the "divining rod;" and Mr. Harvey, in your last impression, states that it had caused him considerable surprise that none of your correspondents had attempted anything like a natural and scientific explanation of it. He then goes on to describe what he calls his own theory—that of electricity. All mineral veins, he says, have currents of electricity passing through them, and most persons who use the dowsing rod are more sensitive to these currents than others.

This, Sir, has called to my remembrance that one of your oldest correspondents, Mr. J. Y. Watson, F.G.S., broached this very theory more than thirty years ago, not only in the *Mining Journal*, but in a communication to the Society of Arts, embracing not only the effects of electricity in the formation of mineral veins, but also their effects on professional "dowsers." This was also referred to in the *Mining Journal* of Feb. 27 in the present year, when, in noticing the reviewer of Mr. Thomas Welton on Jacob's Rod, you observed that—

In the "Gleanings among Mines and Miners," published 30 years ago (1845), by Mr. J. Y. Watson, F.G.S., a "dowsing" expedition in which he engaged with an old and firm believer in the science is there described, and the rod used was a hazel twig, forked at the end like a pitchfork. The prong ends were tightly grasped, one in each hand, and the long end of the twig turned up towards the face. "And with the hands thus holding the rod," Mr. Watson goes on to say, "and pressed close to our sides in a very constrained position, we marched across field after field; the result to me was only a pain in the arms, but my companion's rod, or the perpendicular part in a line with his nose, was once or twice suddenly jerked forward as he passed over what he was ready to stake his reputation was a mineral vein." This man was described as of a highly nervous and excitable temperament, as all dowsers are; and the narrator ventured to ask the question whether electricity *might* have anything to do with the movement of the rod? The backs of lodes, he says, crop up to the surface; they are generally filled with water, and it is supposed that strong electric currents pass through them. Would, therefore, a man of highly nervous temperament be more susceptible to electric currents than others, and could he by walking over the back of a lode, with nerves and muscles in a high state of tension, be capable of receiving a shock sufficient to move the muscles of his arm, and thus agitate a rod held with difficulty in its upright position?

This is in strict accordance, as it appears to me, with the theory expounded in the ninth paragraph of Mr. Harvey's letter.

X. Y. Z.

THE DIVINING ROD.

SIR,—I see from last week's Journal that the *rod*, so much abused and ridiculed by some people, is acquiring supporters. There is a long letter from a literary gentleman, subscribed "Scrutator," who had no need to be ashamed to give his name. There is also a letter from the intelligent and practical Capt. Absalom Francis (brother of the late Capt. Matthew Francis); one from "V.," another practical miner; a further contribution from Capt. Tregay; and one from "Fair Play;" so that the suffrages are in favour of the doctrine that lodes can be found by the rod, when properly held. One day last week, being then at St. Columb, I met a gentleman, who said to me, "I see that you have been writing in the *Mining Journal* about the dowsing rod." "Yes; what is your opinion about it?" He replied, "I can, by its use, find any kind of lode, and am willing to do it for anyone who will pay for the time occupied." I think that the evidence given in your last number of its utility as a lode indicator should shake the cherished unbelief of its opponents. If, "in the mouth of two or three witnesses every word shall be established," as Scripture says, surely we should credit a *greater* number of witnesses who attest the fact. Those persons who want to know the "why and wherefore" of this mysterious agency will oblige by waiting for an explanation till they show your readers *how* it is that the magnetic needle points northward, and explain all the phenomena in relation to it. I am glad that "Scrutator's" superior talent is brought to bear upon this question. "Facts are stubborn things;" and the correspondents above quoted have given *facts* in favour of the rod's use.—*Truro, Sept.* 14. R. SYMONS.

[The above came too late for last week's *Mining Journal*.]

THE DIVINING ROD.

SIR,—I have read with much interest the correspondence going on in the Journal on the above subject, but no letters have I read with more interest than the letter of Mr. Thomas Harvey, inserted in last week's Journal. I am not now going to refer to the various correspondents who have taken part in the discussion, but I cannot help thinking that some of the arguments both *pro* and *con* are (if they may be called arguments) very vague indeed, and go to prove nothing.

Mr. Thomas Harvey seems to be the first of your correspondents who has attempted to set forth a theory explaining the cause of the hazel twig bending down to the influence of the lode. Now, in order to lay down a correct theory it must be necessary to gather together all the facts that can be known, otherwise one fact will clash with another, and the theory that may seem so plausible to the uninitiated will be overturned directly; therefore, in order to establish a correct theory all the known facts must agree together. Mr. Harvey has not done this, and we cannot accept it as a true theory. There are facts in connection with the divining rod which go to prove that the theory suggested is not the true one. I will not stay to quote Mr. Harvey's theory, your readers can refer to it on page 1041. In the first place, have we any evidence that springs of water are charged with electricity? If we lack evidence on this point then we are not certain that electricity is the cause of the bending of the rod. Again, I have seen the rod bend to a bed of quartz, and no lode near it. Is a bed of quartz charged with electricity? A fortnight ago one of the correspondents in your Journal stated a circumstance—that a party agreed that in order to prove the truth of the dowsing rod a penny should be put into a hat, and if the dowser could find under which hat the penny was concealed at the first attempt they would believe in it. In the presence of such an occular demonstration the parties would not believe. If the rod is influenced by electricity, as Mr. Harvey thinks, where was the conduction from the penny to the hat? He could, of course, have stood upon those hats in order to make himself a conductor. There was no connection whatever between the rod and the money under the hat. I have known men who would stake anything that they would find a penny thus concealed. Dowsers also say that the rod will turn to a piece of iron, and it is not at all necessary that the man should stand on or touch the iron.

I think that Mr. Harvey must look for some other theory than the one he proposes, as it does not seem to agree with all the facts which surround the mystic rod. ——— Z.

THE DOWSING ROD.

SIR,—A printer's error makes a sentence in my last week's communication unintelligible. If the letters "un" be prefixed to "successful" it will make all the difference. Whilst correcting this you will perhaps allow me to add that we have cut another powerful lode by aid of the dowsing rod, and even ascertained its heaves, of about 7 fathoms, by a strong cross-course. I am also induced to mention the virtue of the rod to discover money. In this case the dowser was blindfolded, and four hats placed on the ground; a penny was put under one and an half-crown under another. At the blank hats no motion whatever was seen in the rod, but it turned quite rapidly to the others. The dowser never tried the experiment before, and when the instance of finding a watch was given in the Journal of Sept. 11 he though it was simply someone "poking fun." J. B.

Isle of Man, Sept. 21. ———

DOWSING AND DIVINATION.

SIR,—I presume that as we heard nothing further from "N. B." in last week's Journal he has wisely determined to withdraw from the controversy. This is perhaps the best thing that he could do, but, if not, I hope before he resumes the discussion he will carefully study the subject, carefully examine (without prejudice and prejudgment) the evidence for and against it. The discussion which has been provoked will no doubt be the means of doing much good. In the first place, it will bring the subject prominently before the public; secondly, it may lead in the course of time to the general adoption of the science to the practical wants of the age. When we take into consideration the present system of mining operations, all the enormous capital that is uselessly expended, the great sacrifice of life that frequently occurs, the annual loss to the country, both of capital and human life, together with the high price of coal and other minerals, and consequently at times the partial stagnation of the trade and commerce of the country, one would think the above would demand and command the attention of all who study their own individual wants, or the good of their country. But, great as this subject is, I think the educated natural gift of clairvoyance which undoubtedly possess to such an eminent degree to be still greater. Such startling statements as are made by the author of Jacob's Rod cannot long remain unnoticed. He tells us of mines which have been discovered where none were supposed to be by the above means being used. In his letter last week he says, "I declare and affirm that by means of my wife's faculty of clairvoyance I have found the absent dead, discovered deeds long lost, whereby the rightful owners recovered their estates, prevented fires and loss by shipwreck, detected kleptomaniacs (commonly called thieves, although rich), cleared the innocent of false charges, and so fixed the guilt on the right person, saved lives by prevision, found mines now being worked profitably, and water also, and last and most important, prescribed and cured the hopelessly sick after every other means had been used without avail." This, Mr. Editor, is a startling statement. If this be true (and I have every reason to believe it to be so), where does such philosophy lead us? What I ask is it not possible to do, and what will eventually be the result of all this? Startling as the above statements are, I may say that from an acquaintance with Mr. Welton he has told me of things, if possible more so, and not only told me of them, but has given proof that what he states is the truth and not fiction.

Seeing if this science is universally adopted (as it now, no doubt, will be) that it will work no less than a revolution in the whole mining world, need we wonder at the sneers and jeers of those who are interested in the present system, and who, like the Pharisees of old, choose darkness rather than light, because their deeds are evil? From the earliest times on record narrow-minded, self-conceited, simple men have been found ready to assail every new truth and science they could not understand. In all ages men of science have been abused, have been sneered and jeered at, imprisoned, and, in some cases, beaten with many stripes, all for Truth's sake. But, in spite of all opposition, Truth and Science have advanced in all ages; they go on, as it were, hand in hand, defying all obstacles, overcoming all difficulties; their march is slow but sure; ever, ever onward will be their course till time shall be no more. When is all this ignorance to cease? When will men learn to be wise? As well may they attempt to stop the flowing tide as to arrest the onward march of Truth and Science. Degrading and melancholy is the fact, but still we must admit its truth that even in our so-called free and enlightened country, in the 19th century, narrow-minded men are still to be found who do not scruple to attack and assail every new truth and science. But, to return, for fear of intruding too much on your valuable time and space, I quite agree with what your correspondent (Mr. Tregay) says in his last letter, that "the amount of evidence brought forward through the Journal from your numerous correspondents in favour of dowsers and dowsing is already, no doubt, sufficiently surprising to some, but I am perfectly satisfied there is still more to come, even when what

has been already given shall have multiplied a thousand times." On the other hand. I cannot say that I agree with the opening remarks of your correspondent (Thomas Harvey), who says, "it is idle either to affirm or deny, as many of your correspondents do, the existence of some unexplained force either in the dowser or the rod." Now, I cannot see the force of this argument. Surely, if one has good grounds for affirming or denying a thing he would be justified in doing so, although he may not be able to explain all the various phenomena connected therewith. Are there not many things too numerous to mention in this small world of ours that one cannot explain? Can we explain how a small acorn becomes a mighty oak, &c.? "The wind bloweth where it listeth, and thou canst hear the sound thereof, but canst not tell whence it cometh or whether it goeth." In another paragraph he says, "it has occasioned me considerable surprise that none of your correspondents have attempted anything like a rational and scientific explanation of the theory, &c." To this I would reply, that first of all let us prove, or try to prove, that there really is such a force or attraction. If we cannot prove this I think it would be worse than useless to attempt to explain the precise nature of a thing that we cannot prove to have any existence. Would it not be better to follow what appears to be the regular order of Nature—"first the blade, then the ear, and then the full corn in the ear." I have no doubt that when the time shall come some among your correspondents will be found who will no doubt be able to explain the whole theory of the thing.

FAIR PLAY.

LYTTLE'S METALLURGICAL PATENTS.

SIR,—I am happy to meet with one like "Ferric Carbide," who has the candour to state his objections, and with them to express his desire for explanation, because the completeness with which I hope to set aside his doubts will not only, I trust, be satisfactory to him, but to many more who have silently taken an interest in the same great question. I am sorry to have to say, however, that "Ferric Carbide's" letter is replete with misconceptions from beginning to end, and I regret that he did not accept the invitation conveyed in my advertisement by applying to me, because I should have had much pleasure in sending him a complete description of my processes in printed pamphlets.

So far am I from differing in any point with Mr. I. Lowthian Bell that I take no small credit for being the first inventor who has effected real progress on the exact principles so ably defined by that high authority. In fact, I claim for my processes that they are all in perfect harmony with his researches, and I hold that his admirable analysis of the laws of the present old smelting process points most clearly to the thorough correctness of my practical conclusions against the present process. "Ferric Carbide" should recollect that the "carbon impregnation of Bell" is one of the best known facts brought out in Mr. Bell's book, but the fact, once established, is free to all the world for future development, and the following is the manner in which I have taken the liberty to reason on this fact of "carbon impregnation," as well as to carry my reasoning into effect.

Mr. Bell proves that carbonic oxide unquestionably undergoes decomposition in the presence of iron ore, and that the result is the impregnation of such ore with finely divided carbon. It is universally allowed that this is the source of carbon from which the deoxidated iron obtains the surcharge of carbon which converts it into that ferric carbide, or pig species, to which your correspondent claims by assumed name to belong. So long as lump ore is used in blast-furnaces it is absurd to look for reduction in any other than the present method, because nothing can possibly replace carbonic oxide, *as the means by which the lump of ore is impregnated with finely divided carbon as the reducing agent.*

The value of powdered carbon as a reducer of crushed ore has so long been known to chemists that it is unnecessary for me to say a word in its favour, and it is equally well known that the greater part of the heat developed in the combustion of fuel becomes latent in the carbonic oxide if all the oxygen of the blast is combined in that form with carbon. In this light, carbonic oxide is by no means an economical means of reducing ore, and my principle is to impregnate the crushed ore with finely divided carbon *mechanically outside the furnace*, and to have no more carbonic oxide in the furnace flame than will suffice to render the presence of free oxygen impossible. I have no doubt that "Ferric Carbide" is well aware that 1 lb. of carbon burned into carbonic anhydride will evolve at least as many units of available heat as 3 lbs. of the same carbon converted by combustion into carbonic oxide. This is the source of the great economy for which I look out as an absolute certainty under my process, but no such economy is in any way possible in the old blast-furnace so long as the heating fuel is consumed in contact with the fluxes and reduced metal, because Mr. Bell has proved beyond all doubt that under the peculiar conditions of that furnace nothing but carbonic oxide is produced by the oxygen of the blast.

The essence of my process lies, firstly, in the "impregnation" of the crushed ore with powdered carbon in a manner much more economical than by the formation and decomposition of carbonic oxide gas; and, secondly, in the production of carbonic oxide at the sides of the crucible of the furnace for subsequent partial combustion into carbonic anhydride in the crucible by blasts provided there for that purpose. I am well aware that some ironmasters will have it that I advocate the absurdity of developing the heat within the side chambers, but I repudiate the charge, and anyone who knows the tremendous temperature which is attainable by burning carbonic oxide with a hot-blast will see clearly enough that I have at command in this modification of the blast-furnace a source and degree of heat which never can be had under the old process.

Under my smelting process the first thing to be done is not very revolutionary, because it consists merely in knocking two or more capacious holes through the sides of the crucible of the old blast-furnace, and building up at those points carbonic oxide generators or furnaces, the function of which shall be to generate that gas by a cold blast in the usual way, and pass it through the holes under the force of a blast into the crucible of the old furnace. These holes must be packed with gannister, and provided with tuyeres at the inner or crucible end, which shall throw blasts of air in any desired volume backard against or in the face of the carbonic oxide flame as it it enters the crucible. All who have studied the production and use of carbonic oxide under the leadership of Siemens will be well aware that the temperature in such generators, if they are sufficiently capacious, need never be high, because so much heat is absorbed in the required gas, and neither the construction nor working of such generating chambers can be the cause either of difficulty or expense.

I have much pleasure in being able to assure all who have watched with interest my battle with unfounded prejudice that there is no risk whatever of the disintegration of the compounded lumps of ore fluxes and fuel when subjected to smelting in the blast-furnace. The contrary has been proven to be the case on a large scale, and that, too, under circumstances of the greatest difficulty ever experienced by any patentee. The clay used in consolidating the compound into lumps hardens in the heat like a brick, until the melting zone is reached, when the lump collapses, and the clay constitutes a lime-saving element of the needful flux.

At this point I must answer a very important question put by "Ferric Carbide," and that is whether the compounded lump will flux and give up its metallic contents at the right time and in the right form as ferric carbide or pig-iron? My answer is that it always does fulfil these conditions when the right fluxing conditions have been obtained, and that in my smelting process, as in the old one, the adjustment of the fluxing proportions *can only be settled experimentally for each individual ore.* This is a difficulty in every process dealing with the smelting or the reduction with fusion of the furnace charge, and when once the required proportions are adjusted by trial in the usual way my process will answer for all ores alike. The intermixed carbon acts not only as a most energetic reducer, but serves to ensure the production of highly carburetted pig at a much lower temperature than that found to be indispensable under the old process. In fact, I look upon the future existence of the hot-blast as doomed, and it is the duty of those who are interested in the making of hot-blast stoves to throw upon my process all the cold blast of misrepresentation which they possibly can, unless they wish to be signalised as exceptions from all others who are hurt by pernicious invention.

Under the old process it is quite impossible to get the full value out of the heat generated, except by the use of a very tall furnace, and nothing can be more true than Mr. I. Lowthian Bell's recent statement that a 45-ft. furnace is imperfect, and that perfection cannot be hoped for at much less than double that height. This indisputable statement, however, refers only to the blast-furnace under the old method of reduction by carbonic oxide alone, but the reverse is the fact with mine, and I have no hope of any good result with any furnace exceeding 36 to 40 ft. in height. The reason of the difference, as well as of the enormous saving of capital outlay in my favour, is this, that the close incorporation of the carbon, ore, and fluxes under my plan *causes such an acceleration of all the needful reactions* that a greater height is worse than useless. It must never for a moment be forgotten that in my process the ascending flame is a heating agent only, and its functions are to melt in the crucible, to bring up the charge to the melting point at the boshes, to maintain a reducing heat from that point upwards till its exhaustion makes it fit only to warm and dry the fresh lumps of compound at the furnace top.

The saving in the cost of furnace will be enormous, because it will not be necessary to restrict the diameter of a 40-ft. furnace, as compared with one of double that altitude, and the weekly output would, therefore, be the same even if the smelting were not more quickly effected than at present. I do not propose to incorporate more powdered coked fuel with the ore than 7 or 8 cwts. at the utmost, and the dust of uncompressed brittle peat charcoal if used for this purpose invariably gives a charcoal pig equal to the finest Swedish pig made with wood charcoal only. The peat owner who entertains the fears expressed by "Ferric Oxide" must be a most irrational person, when I declare in my advertisements that no plant whatever is needed but the spade, and no costly ovens of any kind. If a man is ready to object to the reclamation of his peat land at a large profit merely because he is frightened at the capital outlay of 3s. or 4s. for each spade he deserves to be speedily buried in his own bog.

The compounded lumps charged into a blast-furnace will have no weight to bear but their own ,and no fuel of any kind will, with my consent, be interstratified with them, because the combustion of a lump of coke when covered by a thick varnish of slimy slag in the crucible of a blast-furnace under the old system is disgraceful to the scientific character of the iron trade if any longer continued. The development of carbonic oxide as a gaseous fuel can be readily as well as cheapily provided for as proposed by me, and with this simple addition to the old blast-furnace it becomes at once available, if not too high, for the new process. The source of heat becomes then totally separated from all chance of contact with the reduced iron, and one fertile cause of contamination is thus at an end, whilst the question of cohesion can no longer be any element in dealing with the most dusty peat charcoal as the purest smelting fuel.

In the old process when too much beer goes round at night it is not unusual for the proportions of the furnace charge to be neglected to the owner's loss, but as nothing but lumps compounded by daylight will be passed up when my process is in use no such waste can occur. Moreover, if enough fuel has not been interstratified with the ore under the old process there is really no remedy till the wrongly proportioned charge tardily works down if the furnace is not "g obbed," but in my process any degree of heat, up even to that which would endanger the fabric of the furnace, is every moment at command by the mere regulation of the blasts which work the generators, and partly consume the carbonic oxide flame, and this heat can never be developed accept inside the crucible, where its heaviest work has to be done.

Instead of the duff of collieries being debarred by its well-known impurity, I have had its purification by washing tried by a coal-owner, who admits that when thus treated on the Cornish plan of washing ore the light dust of absolutely pure fuel is carried forward by the stream, and all the pyrites, shale, and other impurities are left behind. Such a complete purification is done at a cost which is merely nominal, being under 6d. per ton on a large scale, and it is impossible when lump fuel is employed. I, therefore, look forward to the speedy arrival of the time when the ironmaster who wishes to hold his place in the trade for a tough pure metal must crush and wash all his coal for the perfect elimination of pyrites.

Pig-iron must always be made in vast quantities for foundry purposes, even assuming that no more pig were required for the production of malleable iron and steel, and I have, therefore, dealt only with my pig-iron process in deference to "Ferric Carbide," who appears to ignore the far more important process for producing the finest cast-steel and malleable iron direct, not from pig, but from the ore, and without the troublesome use of any fluxes in effecting the needful reduction.

The last and really most important question raised in "Ferric Carbide's" useful, though needlessly sneering, letter is the economical preparation of the compound in lump form, and he is quite right in concluding that I have not lost sight of this subject, because I have devoted the most careful attention to every possible means of ensuring a true estimate of cost. I was forced to do so through the manifestly wild theorising of several experts in the iron trade who never had the slightest experience of any analogous work. By enquiry of the users of several ore-crushing machines, I found that Mr. Marsden's apparatus, when supplemented by chilled rollers, would thoroughly crush calcined iron ore at a cost ranging from 4d. to 6d. per ton, and that if the red-hot calcined ore is shot into water from the calcining oven it becomes so friable that the cost of crushing is much reduced. The only authorities from whom I could get any perfectly reliable figures about the cost of mixing and pugging into lumps the compounded ingredients are the London brick-makers, who deal regularly with a conglomerate which is almost precisely similar in a mechanical point of view. Their estimate of the maximum outlay on this finishing operation is 9d. a ton. Assuming that the ore is below the average in percentage of iron, and that 3½ tons of compound will be required to yield 1 ton of pig, the total cost of crushing, mixing and pugging will be 4s. 4½d. per ton of pig. Against this, on the other side of the account, must be put a saving in lime, in consequence of the use of clay, which partially replaces the lime, with most ores, as a flux, and the saving in fuel, which by itself alone will be, I believe, double the above cost. Bearing in mind the fact that the intermixed lime and alumina make their own of every atom of silica by combination therewith long before that body can be reduced to silicon, it is certain that a pure pig of superior quality must be the result of the new process, and as sulphur is equally eliminated by the incorporation of the lime it is reasonable to expect at least 20s. a ton of a premium in the market price of the new metal.

I have left the substitution of coal dust or "duff" for coke entirely out of the question, so that the margin in favour of the ironmaster leaves a large room for error, with a still respectable balance of net gain. A horizontal mixer feeding the compound into a strong vertical pug mill and an ore crusher make up the list of needful plant, because it will suffice if the compound is extruded from the bottom of the pug mill in irregular cylindrical lumps. These lumps need no drying, and should go to the furnace direct, where they become dry at the top, harden as they go down, and keep their shape for the free passage of the flame like lump ore. Each lump gives out a large volume of carbonic oxide under the reducing heat, and this can be utilised for gaseous fuel by a simple arrangement, without any difficulty from the watery vapour of the damp charges of compound.

On no account must any attempt be made to pug wet and soft plastic clay with the other ingredients, because it entails a great waste of power. The natural lumps of clay become easily disintegrated when pugged in the horizontal mixer with the mineral powders, and water can then be added. I hope to take up the steel and malleable iron process at some early date, but I shall never attempt to qualify myself by that singular apprenticeship which "Ferric Carbide" deems essential to a true knowledge of the iron trade—the privilege of working with a bungling manipulator, who allows his laboratory to be pervaded by "noxious fumes." His sneering remark about those inventors of the Thames district, who venture to trespass on Northern preserves, applies specially to Mr. Bessemer, the greatest glory of the iron trade, and needs no reply from me.

W. A. LYTTLE, C.E., F.C.S.

The Grove, Hammersmith.

THE NASCENT COPPER PROCESS.

SIR,—I have to correct an error in the printing of my letter, published in the Supplement to the Journal of Sept. 11. In giving the description of the second calcining of the ore in connection with the above process, it should have been the calcined ore is then mixed with *salt*, and not *sulphur*, as printed. This correction, coupled with a reference to the article published in the Journal of Aug. 28, as to the first grinding the raw ore to powder, will convince your correspondent, "Reader," that "C. E." is not in quite so great a fog as he supposes in reference to the treatment of ores by the chlorodising process. I may here state that I am quite aware that it is usual to burn pyrites for its sulphur, &c., in a rough state—*i.e.*, broken to the size of road metal.

In reply to Dr. Emmens' remarks in reference to my letter referred to above, I have to state that he still leaves the question of difference between the Nascent and other wet processes unanswered. If it has been fully answered in the letter which he refers to as published a year ago, perhaps it will not be asking him too much to re-publish it for the benefit of those who had not the pleasure of seeing it at the time. As to the question of cost of working expenses in connection with the treatment of burnt Spanish ore, I should have stated that 22s. to 23s. per ton includes maintenance of works, rent charges, and cost of management; and also to state that if Dr. Emmens can work his process as he states for 12s. per ton, and it includes all the operations referred to in my last letter, and the charges above named, he will be conferring a great boon upon those who are engaged in extracting copper by the wet process if he will be good enough to give the means by which he obtains so favourable a result.

As regards the question of the extraction of silver from argentiferous copper precipitates, I have to state that I am aware that it is possible to separate the silver from the copper contained therein but I am at a loss to know who amongst the copper smelters are purchasers of this article, paying for the value of the silver in addition to the copper; and, as Dr. Emmens does not propose to treat the precipitate himself, the best answer he can give to my enquiry is to give the names and addresses of those firms who are purchasers of this class of copper precipitate, paying the seller for the both values contained therein, instead of throwing the question back on me by stating that I ought to know that argentiferous copper precipitate is a marketable article for both values. Dr. Emmens having admitted that it will not pay to mine and work by his process ores containing 1 per cent. of copper and 4 ozs. of silver per ton, I shall feel obliged if he will state what produce ore will pay a profit to the mine proprietors after paying for mining it and treating it by his Nascent process. I shall also esteem it a favour if he will state the percentage of copper and silver that remains in the ore after it has been treated by the above process.

C. E.

THE NASCENT COPPER PROCESS.

SIR,—To respond in full to your several correspondents of last week, and elucidate the mysteries conjured in the brains of so many anonymous writers, would fill a small volume, and require you to at least issue a second supplementary sheet; but I will endeavour to spare the obliging Editor of the *Mining Journal* so much trouble, by calling in the aid of brevity, at the same time avoiding dilatory curtness. We will commence with—

No. 1, "C. E.," who strikes his lyre and cymbals, and gives us the key-note of all that should be melodious in the symbolic language of chemistry; the strains of his music are, however, somewhat more discordant than dulcet, caused, no doubt, by a mistake of copy, as I never heard of sulphides of copper and silver being converted into chlorides by simply calcining ores with sulphur. Still we all know that even printers are not infallible, and it is easy enough to alter the chord, by reading "chloridising" for "calcining," and "salt" for "sulphur." If "C. E." will kindly peruse the Journal of Aug. 28, on page 938 he will find full detailed particulars of the Nascent Copper Process. For myself, I might say, *multum in parvo*, there is nothing new under the sun, tantamount to confessing all patents to be the remodelling or blending of old ideas, not exactly lost, but used up or gone before. This would, perhaps, rudely answer the questions asked; but a polite enquiry is, at least, generally entitled to a courteous response, more particularly where the thirst for real knowledge is so apparent. No one attempts to dispute that hundreds of thousands of tons of Spanish pyrites, giving 2 to 3 per cent. copper ore, have been successfully treated for some time past; but, where copper ores contain no silver, the use of boiling brine, which means some cost, is simply absurd, for when once sulphides of copper are converted into chlorides hot water without any saline matter will dissolve the copper. Again, chloride of silver can be collected by an old process of mixing the chloridised silver ore with boiling brine—that is, lixiviating it—allowing the filtered brine, containing chloride of silver, to pass over sheet copper, when silver is precipitated; but I defy the world to pronounce one case where silver ores under 12 ozs. silver per ton have been profitably treated—therefore, upon low-class ores it is a commercial failure, whereas the Nascent Copper Process, under careful manipulation, will extract as little as 4 ozs. silver per ton blended with 1 per cent. copper, to more than 100 per cent. profit. An old proverb sagely contends "There is a time to laugh and a time to cry," which conveys to my mind the hypothesis that there is a limit to everything good or bad. Some of us, who have conducted mines yielding *small quantities* of rich quality ores, know this to our sorrow. The Nascent Copper Process claims no merit in saving the righteous or rich ores, which are whole, and need nothing but the miners' skill and toil to discover and unearth them. The process would be entirely out of place if it accepted an invitation to mingle with the throng of those who can afford to laugh, as ores over 4 to 5 per cent. copper and silver 20 to 30 ozs. per ton should go direct to the smelting-works. The "time to cry" is the appointed period for help, when all hope has passed and ruin is inevitable. Mining men as a rule are indifferent and callous, engendered, no doubt, by one prize only appearing upon their drama of life to one hundred blanks, but scores can enter feelingly into a "bal" winding-up, as who has not at some period or other watched his "hobby horse," or favourite mine, with agonising look and moistened eyes, breathing the last long fitful gasp? when the undertaker, in the shape of some waggish auctioneer, passes ribald joke at the "burial feed," and with the utmost nonchalance places the shroud over so many once bright hopes and animations, by knocking down the machinery and materials to the invited guests for as many shillings as the costs have been pounds. Is it not now the season or "time to cry," Mr. Editor? Then why do'nt you weep? *mais doucement!* The world laughs, and well it may! for auctioneers and their attendants will henceforth be at a discount, when in the future the poorest of mines by the Nascent Copper Process shall hold their own for generations! "C. E." kindly advises me to operate upon Spanish ores containing 2 to 3 per cent. copper, but I am content to aim at our English mines, throwing aside as useless 1 to 2 per cent. copper and 4 to 8 ozs. silver. "Effectual and economical chlorination" of these ores by the new furnace is the grand starting point, in order that the Nascent process may with good profit operate upon the very lowest of the low-class material; in fact, the two patents combined, in their own language, modestly, but authoratively, claim the novelty of converting poor mines into rich ones, should the sequel prove the assertion to be incorrect the patents, like many others, will have no intrinsic value, and they will ask, and no doubt obtain, permission with the patentee to quietly pass into oblivion; but a true and legitimate success must meet with its reward—that is, the tide of popular opinion will set in, when possibly infringements may occur, which can only tend to strengthen the value of the patents as real novel improvements, and the closing scene most assuredly will not take place in the esteemed columns of the *Mining Journal*, but through a court of law and justice. "C. E." also wishes to hear of the best market for precipitate containing silver and copper. Any smelters, especially Neville, Druce, and Co., are only too happy to purchase the article at their own price—that is, they deduct about 30*l.* per ton for return charges, similar to the amount imposed upon tin ore. It is proposed for the Tamar Works to purchase precipitate and separate the two metals under the joint ideas of Dr. Emmens and myself. More than this I am not prepared to say, as I am only second fiddle; Dr. Emmens plays the air, and the humble servant of "C. E." simply chants the refrain. Very possibly the last, but not least, question is intended to be a poser—"How does Mr. Barnard manage to get a profit out of working ore containing 1 per cent. of copper and 4 ozs. of silver per ton after paying for mining it?" I can only answer that if 45 lbs. of tin per ton of stuff, worth 20s. per ton, can be made to yield a profit, it is far more easy for 1 per cent. copper and 4 ozs. silver, worth 25s., to follow suit, when the costs of dressing or operating upon the latter are less than one half of the charges that must be levied upon the former, as for procuring or mining the two different articles, I am not aware that silver and copper fall like manna from the clouds, and neither does the tin ore operated upon by the successful Capt. Teague find its way down a Jacob's ladder into the "stamps' pass." Nay, capital, machinery, ingenuity, toil, and perseverance have to be employed for its actual production before the stamps commence the first act of the dressing process. I have done my best to fully answer "C. E.," and shall be happy to give him any further information in my power that he may desire to elicit. The question as to the relative quantity and cost of mining for and producing tin—say, 45 lbs. to the ton, and copper ore 1 per cent. and 4 ozs. of silver—is a subject I leave to be discussed and decided upon by practical mine agents, who undoubtedly are the best authorities.

No. 2, Stephen H. Emmens.—Here is a hard nut to crack, but the kernel is good, and with permission I will reserve the nut for some future feast day (not a "burial feed"), when mayhap both my impaired molars and digestion will be in better trim. I must, however, inform Dr. Emmens that neither he nor I have hitherto had the grand success anticipated. The babes are not yet out of the wood, although it is highly satisfactory to find that we can treat the lowest class ores to greater profits then the most sanguine hopes ever calculated, actually proved and demonstrated upon a small scale; but the public is a hard task-master, and to win triumph

we must concentrate our efforts at some particular spot or other, and fulfil our mission and promises by converting a long and heavy calling mine into a dividend-paying one. A little shower douche I know will only stimulate Dr. Emmens, who can in reality without boasting of it, like a certain lion, shake off the dewdrops from his mane, and press forward in the battle of successful mining with renewed vigour.

No. 3, "Subscriber," who flatters me by saying "It is quite refreshing to see your old correspondent, Mr. Barnard, again in print." I beg to return the most sincere and heartfelt thanks on the part of my best friend T. J. B., he also desires me to add that he is more than "refreshed" by a kind word; in fact, speaking for myself, I am afraid that a few kind phrases would not only refresh but almost intoxicate, at least with pleasure my friend who has striven hard to benefit mining, and received "more kicks and blows than ha'pence."

No. 4, "Caution," hits hard, and gives me credit for being able "to gull a nation." I am no pugilist, but am not by nature a coward, and, therefore, like the Irishman, must endeavour to parry the blow somehow, if only with my nose. "Caution" seems to think that it requires many instead of "a few years" to master the pursuit of mining; perhaps so, but I have served an apprenticeship of seven years, and certainly acquiring the art "to gull a nation," the greatest ambition of some mining men, should be conclusive that I have well learned my trade, but no! it is false, the dream of my life has always been to win the good feelings of all earnestly espousing the cause of mining, and by honest, if humble, efforts to make it commercially successful. It may, perhaps, be folly to hurl harsh invectives, which will not assist the object in view, but one's temper cannot always be kept under control, especially when memory recalls the fact of two or three of us not so very long since operating upon low-class ores for the first time at the Queen Mine, subjected to ridicule, and classified as either fools or rogues, or the pleasant combination of both, with no scrip, and a scanty purse between us, followed up by indifferent plant, including old-fashioned furnaces, a boiler with the appetite of a gourmand, redeemed by a plurality of impromptu safety valves, and lixiviating tanks, all exposed to the rude gaze of scepticism, and uncovered save by the broad canopy of heaven; at the very time a few of us were under difficulties endeavouring to bring improvements to the aid of mining, many men, and it would be easy to enumerate some of them, were taxing their brains to the very tension in the real hope of "gulling a nation." Silence! it is my turn, let me speak. My experience of mining has, indeed, been bitter, and I could a tale unfold that would not "gull" but stagger a nation. Even now as these words journey throughout the land there are scores of mining professionals who have no desire to see mining permanently successful. A steady honest business is not their *forte*; they aim only to make money by putting it in their own pockets to the loss of others, and care not if they rob the widow and fatherless. Speculation forsooth! Mining has caused many an aching heart, not so much mining proper, but speculating, or rather gambling with loaded dice, which is nearer the mark, for how can the public expect to cope with or win against such long odds when a market can be run up or knocked down at the will of those who know every card in the pack? Now listen! Newgate let loose would fail to select such incorrigible scoundrels as some who profess to pioneer mining. There is an old saying "Honour among thieves," but some mining men will not only openly rob the public, and would "gull a nation" if they could, but they are so fond of what is called systematic plunder, that their heart's desire is not satisfied until they have robbed each other. Your correspondent may well say "Caution."

No. 5, "Practical;" this writer distinctly states that he has no doubt the Nascent Copper Process will successfully treat poor copper ores, but that 1 per cent. copper and 4 ozs. silver exist only in my "fevered imagination;" referring again to the letter of "Caution," your readers will find that amidst abuse he quietly adds "Of course we all know that there is any quantity of lodey material throughout our mining districts giving 1 per cent. copper and 4 ozs. silver, and we equally know it is impossible to work them to profit, or better men than Mr. Barnard would long ago have been successful." Here, indeed, is great diversity of opinion.

No. 6, "One of the Virtuous Lady Shareholders," will find the "Echo" he seems not to anticipate, in my answer to "C. E." and, therefore, he need not long "pause for a reply."

No. 7, "Faith," narrates a pitiful tale of the days of yore, and proves the old adage which repeats the advisability of not going into ecstasies or exact numerical calculations, until the chickens are actually hatched; but there are several crumbs of comfort for "Faith." Mining has now lost its sting of speculation, and ere long the faithful representatives can show a will and way of their own, and not be the cat's paw for wealthy smelters. It may, perhaps, appear paradoxical when I, with confidence announce that we shall require the services of smelters no longer, as a former portion of this letter distinctly remarks that copper ores containing 4 to 5 per cent. should not be treated by the Nascent Copper Process, but taken direct to the smelting furnace. Allow me to explain. Many mines return every month 100 tons copper, yielding (say) 7 per cent. copper and 4 to 8 ozs. silver per ton; of course 100 tons 7 per cent. are equal to 700 tons 1 per cent., and to obtain the 100 tons 7 per cent. not less than an additional 1300 tons 1 to 2 per cent. copper, and (say) only 4 ozs. silver, or equal 2000 tons, must be turned over. Some of our best mines will average 2 per cent. copper, but the patent process aims only at 1 per cent., for the stringent reason that the backs of the lodes, particularly gossans, often give no copper at all, but 10 ozs. silver, and it is by bringing the average of copper down to 1 per cent. that the entirety of a lode can be treated, and silver, when the workings are upon a large scale, practically secured by the ton: 2000 tons containing only 1 per cent. copper and 4 ozs. silver per ton, to say nothing of arsenic or sulphur, represent 20 tons copper metal and 8000 ozs. silver, rather different to 100 tons 7 per cent. copper sold to the smelters, with the deduction of 2*l.* 15s. per ton return charges as a preliminary starting point; again, there is the needless cost of carriage, which, indirectly, the honest miner has to pay for out of the sweat of his brow, and 21 instead of 20 cwts. to the ton is no sinecure.

Naturally the argument may arise that coals are cheaper in Wales than upon Cornish mines. Pshaw, ridiculous! the same price, less conveyance; and pray which is the most economical method, to export 1 *ton* of ore to Wales or to import 2 *cwts.* of coals from the black diamond district?

Honest miners (I do not include "Caution"), there is no occasion for you to acquire the art "to gull a nation," since only perseverance, science, and diplomacy or good management are required for the public to cease growling, and rain a shower bath of blessings upon your heads. THOS. J. BARNARD.

Trafalgar House, Plymouth, Sept. 14.

THE PROPOSED CHANNEL TUNNEL CROSSING.

SIR,—I was greatly interested in reading the letter of your able correspondent, John de la Haye, C.E., of Jersey, in the Supplement to last week's Journal, and I thank him sincerely for the manly outspoken opinions he has given so kindly in favour of my scheme, and for his laying the lash upon those who have meanly stolen—or at least attempted to rob me of—that which not enriches them, but makes me poor indeed. I have also been favoured by receiving an article in the "Barrow Daily News," of which I enclose a copy for your kind insertion (wholly or in part), knowing your wish to serve me in my untiring perseverance to accomplish a great good, which will most certainly send civilisation, peace, and commerce through the whole world, by eventually encircling the earth with belts of railway and telegraph, of which the Channel Tunnel Crossing will be the great key. I trust that a fair and just decision will be given ere long as to which is the best project for the tunnel—Sir John Hawkshaw's, through chalk—or my tunnels, through gault clay.

I regret, however, for Mr. John de la Haye's sake, that I cannot approve of his plan of laying down iron tubes on the sea bed, and covering them up with concrete mounds. It is clever and ingenious, but will not work. I will, with very best feelings, state the objections—1. Iron tubes would very soon be destroyed by quick rusting, especially when bedded and enveloped by sea waters.—2. Iron tubes of 1200 feet lengths (or near ¼ mile each) would be immense masses to move and join together at 180 ft. below sea-level, where divers could not work without immense risks, in making 100 perfect water and air-tight joints to each iron tube.—3. Iron tubes (if used) would be useless if less than 20 ft. diameter, and at that size would only carry one pair of rails, when six or four lines of rails at least are wanted for the great continental stream of traffic approaching.—4. Iron tubes and concrete embanked mounds over them would be liable to a man-of-war or large trading ship dragging anchors, and tearing all up together, as they (the anchors) have done on several occasions already, with the telegraph cables laid down on the channel bed.—5. The expense of construction with iron tubes would be excessive.

I am anxiously awaiting to know to whom the concession will be granted for best design, best position, best strata, and best results, if well done. WM. AUSTIN, C.E.

Dartmouth-terrace, Bermondsey Park, Sept. 22.

The following is an extract from the article referred to:—

Before a farthing should be expended in the work of construction, whether money be found by a company limited, or taken out of the national pocket, ample opportunity should be given for bringing before the British public all the plans which have found favour in the eyes of the French authorities, who have hitherto given far more attention to the subject than we have. By these gentlemen the magnificent plans of Mr. William Austin, C.E., a practical engineer, who for many a long year took a leading part in the actual construction of the great engineering works planned and carried out by Peto, Brassey, and Co., and other notable firms of contractors and engineers, are held to be fully equal, if not superior to those of Sir John Hawkshaw, and it is to hoped that means will be found to enable Mr. Austin to make his views on this subject as well-known to the public as those which Sir John Hawkshaw entertains, and which his position and means enable him to ventilate so thoroughly, while poverty and the want of a great name keeps Mr. Austin in the background. Without going into his plans in detail, we may be permitted to point out the main features in which they differ from those of Sir John Hawkshaw. In the first place, Mr. Austin proposes to run his tunnel under the Channel direct from Folkestone to Wissant, whereas Sir John Hawkshaw's points of departure and arrival (on either side of the water), are not the same. He proposes to go northwards *viâ* Dover from Folkestone on one side and Calais on the other, and to make his line of subway single arch some miles to the north-east of Mr. Austin's route, thus increasing the distance to be traversed by 24 miles most unnecessarily, and adding enormously to the cost of the undertaking. Sir John Hawkshaw considers that the boring will be carried entirely through chalk, which is pervious to water, and through which most serious leakages may occur in the progress of the work, which cannot fail to give considerable trouble however well engineers may know how to deal with them. Mr. Austin, on the contrary, believes, and he is doubtless able to show good grounds for his belief, that the gault clay underlies the Channel in the part where he proposes to construct his tunnels, and that as this is utterly impervious to water the subway can be bored through it without any fear of leakage, while the commercial value of the clay taken out will materially tend to reduce the cost of construction. Instead of lining the tunnels with brick, Mr. Austin, proposes to form the interior casing of magnificent blocks of material formed of slag, harder and more durable than granite, and dovetailed into each other. And as these huge blocks can be put in position by machinery, consisting of a travelling crane and its necessary adjuncts, as soon as the excavation in the clay is sufficiently advanced for the introduction of each in succession, the time, labour, and cost involved in making a lining of brick will be enormously reduced. Another notable feature in Mr. Austin's tunnel is its triple form, for it consists of three tunnels side by side, giving room for the conveyance of goods, coals, and passengers by distinct lines of rail, and obviating the stoppage of the traffic should by any means it be found necessary to close one of the tunnels awhile for necessary repairs, or in consequence of any accident or misadventure. It is impossible to do justice to Mr. Austin's plans in the space at our command, but having thus briefly indicated the leading features in a plan which commends itself by its simplicity and boldness of conception alike to everyone who desires to see in an undertaking of this kind the greatest amount of work done at the least possible cost, we trust that it will not be long before means are found to enable Mr. Austin to place these and other useful conceptions of his powerful brain before the public, who cannot fail to appreciate them, when it is found that they are inspired by sound commonsense and an earnest desire to contribute, so far as it is possible for man to do, to the welfare and benefit of his neighbours.

ENGLISH MINE AGENTS—No. III.

SIR,—Having said some things relative to the wages of mine agents in this country, I will now endeavour to enumerate some of the other evils to which nearly all are, more or less, subject. Perhaps there is no man that is held in greater bondage than he. Many have both the hands and feet tied, and in that condition are expected to run a race which requires the entire freedom of the whole man. One tie is the lack of sufficient capital to prove the undertaking. It must be very painful to a mine agent to have to do much more work, in order to put the mine on a good footing, than there is money at the bankers to meet the expenses of. He has looked thoroughly about him, and has considered what shafts are to be cleared up or sunk, and what levels have to be driven before the mine can be made to pay, except by a mere chance. But this cannot be done, and, therefore, he must alter his plans; he is ordered to do his best to open up what ore ground he can for the time being—so that the directors might have a chance of calling up more capital. Well, in accordance with those directions, he tries a little here, and then a little there, with a very limited number of hands, but nothing turns up. He has a great number of inconveniences which might be obviated—such, perhaps, as the sinking of a shaft or winze a few fathoms, or the driving of a level a little way; but this cannot be done for want of funds, and so the working costs about 50 per cent. more than it should do. Of course, this particular thing does not apply to British mines alone. Many foreign have been worked in the same expensive way, some for want of capital, and others for want of common sense. The latter applies to the Emma Mine, the sinking of the Atwood's winze instead of the shaft, as advised by Mr. Sewell; in consequence, they had an endless amount of trouble and expenditure. You will pardon me, Sir, for digressing from my subject.

Before the necessary returns are made in order to get in the required capital, the capital in hand is spent, and the mine can go on no further; then the agent has to seek a new berth, and, in some instances, is kept without his salary, paltry as it might have been, and then he has any amount of trouble to get it. In this way many a good mine has been spoiled, and many a good agent ruined. Had there been a sufficiency of capital at the commencement the mine might have been paying handsome dividends, and the manager looked upon as one possessing knowledge superior to his compeers; but, instead of that, the mine is put down as a blank, and the manager as an incapable.

Some, and I think they are in the majority, are allowed to act only on the judgment of the committee or board of directors. If the manager's opinion is adverse to that of the board, of course the board must have its way. Practically, how much does a board of directors know of mining? You are aware, Sir, that very few know anything. I could tell you of a circumstance which happened down at the west end of Cornwall, which goes to prove what I say to be true. The tin was lost by a fault in the lode, and the manager contended that it had gone in a certain direction; but the committee said that it must be in an opposite direction, and so they went working in their own way. The manager, being unwilling to waste money in such a way, got his discharge, and another was appointed, who was willing to be servile to anyone so he could get money by it, to carry out their purposes and plans, and thus they went on till all got tired out, and the mine was abandoned without once attempting to search for the ore where the former manager contended it could be found.

I believe in the *use* of a board of directors as much as either of your correspondents or readers, but what I refer to especially is the *abuse* of them. It is but right and proper that any company should look after their property as closely as possible; and it must be a great relief to any manager to have a board of directors who is in sympathy with him, before whom he can lay his plans, and with whom he can advise; but for a board of directors to take the practical working of a mine in the underoround department into their own hands is to ruin the mine directly. Let a board of directors or a company of shareholders get a thorough sound practical as well as scientific man to manage the detail of working the mine, and let they themselves look after the accounts, &c., which they do understand, and the shareholders will find that much more profits will be the result. Give a good manager funds and loosen his hands, and shareholders will not need to mourn so frequently as they do over lost capital. A man who cannot be allowed his hands free ought not to be in the position of manager, and should be replaced by others who can; there are plenty yet to be found. Those who talk the tallest are not the men. Z.

PATELEY BRIDGE LEAD MINES AND SMELTING COMPANY.

SIR,—In the Journal of June 19 I find the name of the above company in the list of newly-registered companies, and am glad to find that the attention of investors is being called to the Pateley Bridge district, which in former times has been productive of such large quantities of lead ore, and, in my opinion, only requires to be developed on an efficient system by day or adit levels, as far as practicable, aided by the application of suitable machinery for following the courses of the lead veins to a greater depth, to return large profits in the future.

The principal and moving cause, however, which has instigated me to write this letter has arisen from observing an article in the Journal of June 12 referring to the above-named company, wherein it is stated that "records show that for the last eighty years continuous and large profits have been made; but very little has been done under the adit, or what is termed the horse level, which is about 50 fathoms in its deepest part. The courses of ore have been proved to hold down, ensuring the remunerative vitality of the property; but to work these productive deposits to the greatest advantage it is necessary to bring in adits or day levels at lower points in the mountain. One of these levels—the Eagle—has drained the run of mines containing the Jarnot and several other veins to a depth of about 80 fms. below the old workings, and a shaft has been sunk 30 fms. deeper to command the several lodes in this portion of the property." "On the other side of the mountain a level—the Perseverance—has been driven for a long distance, and will now be continued under another series or run of mines, draining other courses of ore at about the same depth."

Although it is a source of some gratification to me to find that the suggestion to drive a lower adit as a continuation of the Perseverance level—which I made more than ten years ago to Mr. Hanley Hutchinson, who is named as one of the directors—is at length not only admitted to be necessary in order to work to the greatest advantage the deposits in the Cock Hill Mines (by which name they have hitherto been known), but that it is now in contemplation of being carried out, I must express my surprise that I received the first intimation of such an intention from the Journal.

I may state, for the information of your readers and intending investors in the Pateley Bridge Lead Mines, that the Perseverance level, before alluded to, is included in a lease for an unexpired term of 21 years, commencing on April 29, 1867, now held by the Sunside and Merryfield Lead Mining Company (Limited), the prospectus of which appears in another page of this Journal, of which I am the solicitor and secretary as well as a shareholder, and, inasmuch as Mr. Hutchinson is not only cognisant thereof, but is a party to such lease, it is only natural to suppose that negociations would, at all events, have been commenced with our directors for the use of the Perseverance level before it was announced that "it will now be continued" by the Pateley Bridge Lead Mines and Smelting Company (Limited). Perhaps these preliminaries may have been considered unnecessary, and in that case this letter may suggest not only the desirability, but also the necessity, of concluding terms (which if entered upon at once would be conceded on liberal conditions) for securing such a valuable adjunct as the use of the Perseverance level for the drainage of water by gravitation, and for working the Cock Hill Mines for a depth of 60 fms. lower than can be accomplished by the existing adit level thereto, and, at the same time, supplying efficient water-power to machinery for crushing and dressing the lead and other ores raised out of the mines.

Harrogate, Sept. 20. THOS. SYKES.

THE STANNIFEROUS ELVANS OF CORNWALL—WHEAL JENNINGS.

SIR,—This is an exceptionally interesting, and at the same time it is a somewhat peculiar, piece of mining here, so far west as Gwinear. We have heard of mines of a similar character away to the north and east in Mid-Cornwall—mines worked entirely for the tin contained in the elvan courses or porphyritic dykes which are so frequently met with traversing the argillaceous schists of the county. It is peculiar inasmuch as the operations are not conducted on lodes, but are confined to a stanniferous elvan dyke, and which is one of the largest in Cornwall. It has a width of 12 or 13 fathoms, with an inclination southwards, and a bearing east by south. It is, moreover, bounded on either side by killas, and the tin found in it is not scattered indiscriminately throughout, but in a countless number of branches, which are met with in groups extending across the elvan from south to north, or rather from killas to killas. Thousands of these branches are not larger than threads, while others have varying widths, up to 4 in. and occasionally to 6 in. Although they have an altogether different bearing from the copper and tin lodes of Cornwall, yet they have apparently been subjected to the same laws—that is, they have been heaved, upthrown, and downthrown, and invariably become impoverished when diverging too much towards the east or west.

Extending levels east and west in the elvan is literally driving cross-cuts to intersect the various clusters of veins which run in the contrary direction, and if we liken each channel of these veins to a lode there are hundreds of such lodes throughout the length of the sett; but it should be remembered that they have only a length of 13 fms., the breadth of the elvan course; occasionally, however, splatterings of rich tin, in the form of large cubes, have been found stuck on to the smooth walls of the killas, but in no instance have they been known to penetrate beyond.

This is more friable than elvans generally are, and especially so from the surface down to about 20 fathoms. There are, however, at the deepest point yet reached—36 fms. from surface—several patches of it which are equally soft; meanwhile, the greater portion of it has become decidedly more compact, and with every appearance of its continuing so if explored deeper. Seeing it is now much harder at the deeper levels, it is not improbable but that the branches also will become more concentrated at greater depths—in a word, less numerous, but larger.

We are not aware that either of the stanniferous elvans of Cornwall has ever yet been wrought to much depth, and although in the opinion of some authorities they will not be found sufficiently productive to be remunerative at the same depth that lodes are, it is not our intention to offer any such presumptive opinion until one of them at least has been so mined in order to base conclusions on some analogy.

Admitting that tin in elvan courses does not continue very deep, even then, with one of this width and productiveness, with levels extended through it for the length of an ordinary mine sett to a depth of only 40 fms. from surface, it would develope an important and valuable industry, which, in all probability would not be exhausted for a very lengthened period. CAPTAIN.

Camborne, Sept. 22.

WHEAL UNY, AND THE LATE ENGINEERS.

SIR,—Permit me to offer a few remarks in reply to the letter, signed J. Hocking and Son, in last week's *Mining Journal*. These gentlemen appear to be very zealous on behalf of the company, and attempt to show that I have opposed their views, and am wasting the property of the shareholders. Perhaps it is necessary to state to some extent the reason why the services of the engineers were dispensed with, which they had in writing, but have, however, not published it in your paper. It is well known a few weeks ago tin was down to 45*l.* per ton, and orders were given by the committee to cut down expenses, so that the purser's, manager's, and agents' salaries had to be reduced. We had also to do away with all unnecessary expense, consequently the services of the Messrs. Hocking had to be dispensed with. If the manager on the mine, who alone is responsible to the committee and to the general body of shareholders for the cost incurred, has no control over the expenditure, surely he should not be held responsible. I serve the shareholders, and them only, and watch their interest to the best of my ability, and give but little attention to the commissioned agents of iron-founders, who, as is too often the case, have but one object in view in ordering machinery—fees.

Whilst I am honoured with the confidence of the shareholders I consider it my duty to buy in the cheapest market, and sell in the highest, regardless of privileges, customs, or commissions. If these gentlemen engineers had paid more attention to the engines on this mine, and less attention to polite letter writing, there would have been no necessity to dispense with them as unnecessary, for I have in times gone by had valuable help and assistance from other Cornish engineers, and never before had any reason to complain. I acknowledge having received the polite note referred to in Messrs. Hocking's letter, but as it was a written notice to pull out two of the four boilers at the pumping-engine at the end of October—the wet season of the year—this notice coming at such a time, when the engine was taxed to the utmost, I considered was given with the view to flood the mine, which would sure to have been the case had I complied with it; but, on the other hand, if any accident had occurred, had not these gentlemen put the blame on my shoulders by sitting down in their office, and writing a polite note to show they had done their duty. I saw Mr. Hocking, jun. (who is the acting partner), and remonstrated on the inconvenience, and suggested cast-iron rings in the interior of the tube, but he was inflexible, and would allow no compromise. I had similar orders for the boilers of South Carn Brea, and one of the boilers there wanting some slight repairs I had it taken out, but we had great difficulty in working the engine with one boiler, and Mr. Hocking, sen., happening to visit the mine at the time, saw the boiler out and examined it, said the rings were not necessary, and suggested that it should be put in place at once, in order to prevent flooding the mine, which was done without delay. I have heard nothing further about these boilers until quite recently. I have strengthened the tubes of the boilers, but not by brick arches, as stated by Messrs. Hocking, who knew just as much about the interior of the tubes of the boilers on this mine as about the inside of the moon. Mr. Hocking, jun., suggested in writing that one of the weakest boilers then under repair should be tested, offering at the same time to lend us the tester, which we availed ourselves of, and tested it to about double the working pressure. Messrs. Hocking, however, never visited the mine to see the boiler proved, but they sent in their bill for the use of the tester, which has been paid.

I pay particular attention to the engines myself, for I find by experience since I have been at Wheal Uny that it will not do for me to trust to those who had the fees. I have had the management of mines over 20 years, and hitherto have had no boiler explosions. When I took the management of this mine it had become a byword for boiler explosions and breakages, for there have been no less than five boiler explosions in this mine, resulting in the loss of three lives. The Messrs. Hocking had full control before I took the management of the mine, but they were most unfortunate as to boilers. I bought some boilers at Great South Tolgus a few years since, the Messrs. Hocking were the engineers. I never saw boilers left in such a filthy condition. I believe there was an explosion on this mine a few years previously, resulting in the death of a girl who happened to be passing at the time. I might ask Messrs. Hocking why they did not send the manager of Crenver and Wheal Abraham notice to strengthen

the boilers at that mine, and thereby prevent the explosion which happened a short time ago. The same remarks will apply to the late manager of South Condurrow, where a similar mishap occurred.

These gentlemen's strong point is economy of fuel as well as boilers. I have, therefore, carefully examined the books for the year ending 1869 (that is the year previous to my taking office). I have also compared accounts with the year ending 1874, and although the mine has been sunk deeper since the former period, and larger pitwork put down (it is well known the winters of 1873 and 1874 were excessively wet), yet I find there has been an average saving in 1874 of 18 tons of coal monthly, besides a further saving of 5*l.* 17*s.* 6*d.* per month in oil and tallow. I consider the year 1875 will compare more favourably still, as the winding-engine has lately had extensive alterations and repairs, whereby 25 per cent. less of fuel is now being consumed. Messrs. Hocking have never seen the inside of the winding-engine for years past. I would gladly have taken the management of the mine for what I could have saved out of the engineers' department.

The engineers state that what I am doing is "devoid of all engineering principles." I do not for one moment set myself up as a scientific engineer, my sole object is to save cost. I do not mind whether it is scientific or otherwise, but let us look at their engineering principles. We have a pumping-engine at this mine made in the year 1851 with a 50-in. cylinder, and being made by contract was not over strong to begin with; some 18 years after, when it was heavily loaded and worn, these scientific gentlemen had a new cylinder of 60 in. diameter made to replace the one of 50 in. diameter, which to me looks just as reasonable as attaching an elephant to the harness of a donkey. The result is what might have been expected—the old engine has been pulled to pieces, the main beam itself has been broken twice, and we have had no end of trouble thereby. At one of these smashes to the engine our engineer, Mr. Hocking, jun., happened to be passing by at the time, and although told what had occurred, he, like the Levite of old, passed by on the other side, and left it to other hands to bind up and pour in the oil. The same enlightened "engineering principles" have been carried out at South Carn Brea, where a 26-in. cylinder has been replaced by one of 36-in. diameter. If I had time I might furnish you with some interesting comparisons as to the cost of materials, and other things connected with the engines, but I must defer this for some future time.

Have these gentlemen, who appear to be so very zealous for the best interest of the mining companies, forgotten at the adjoining mine under my control that in putting in a second-hand winding-engine they never once went inside the door of the engine-house, or superintended it in the slightest degree, yet they sent in ther bill for superintending the erection of a 24-in. winding-engine, and did not know that it was only a 22-in. cylinder, and were paid accordingly. I am quite content for these gentlemen to hand over 10*l.* 10*s.* of this money to the Miners' Hospital, and think they ought to do so. It is very cheap to wish the company the greatest success, but I have no faith in any amount of wishes, good or bad, but have the strongest possible belief in helping to work up to a successful issue.

Wheal Uny, Sept. 21. WM. RICH.

WHEAL UNY.

SIR,—"Adventurer" has done well in calling attention to the strange absence of the shareholders from the recent general meeting. Non-attendance seems the rule at Wheal Uny; at the June account not more than two or three adventurers were present besides the Chairman and secretary. I was there myself, and was sorry to see so few there. Next time I hope we shall have a large meeting, not to pass such resolutions as your correspondent thought of proposing, but to hear that we have no more calls to pay, if, indeed, we are not made happy with a dividend. Before then we may fairly expect that a communication will be made between Hind's engine-shaft sinking below the 130 and the rise put up in the back of the 150, there will then be a direct communication at this shaft to the bottom of the mine; this will lessen considerably the cost of returning the tinstone. The new stopes promising so well, and the tinstone improving again in quality, we may fairly reckon on 80 tons of tin for the next 12 weeks, and as the calls just made will leave but a small debit balance, we may, with a moderate rise in tin, fairly hope for a dividend instead of a call at the next account. Those of us, I mean, whose shares are not then forfeited to pay our unpaid calls. PRUDENS.

Sept. 20.

EAST POOL MINE.

SIR,—At the recent meeting of adventurers in this company two or three very important points were raised to which I think sufficient prominence has not been given. I know neither Capt. Bishop nor Capt. Martin, but I certainly question the judgment of the committee—for the present I will say nothing about their right—in using proxies entrusted to them in general terms, for the purpose of swamping a majority of those present upon so important a question as the appointment of an agent, and more especially as those who gave the proxies were entirely ignorant that any such appointment was contemplated.

It appeared that 16 of the adventurers present voted for Captain Martin, whilst only six supported the committee's nominee—Capt. Bishop; and as I always maintain that those who attend mine meetings constitute as a rule the practical portion of the adventurers, the above numbers satisfy me that Capt. Martin was the man who should have been appointed, My view of the matter is that proxies, unless sent for voting upon a specific resolution, should only be used for legalising acts which can only be done by a given number of shares. Of course this is a limitation which it would be difficult to enforce, since it is only a moral wrong that it is committed, but a few such instances may cause much inconvenience to committee-men by preventing adventurers sending proxies at all.

As to the right of Mr. Dennis, jun., to vote I think there could be no real question, so that the ruling of the Chairman—Mr. R. R. Broad—was right, for immediately the letters of administration had been granted the young gentleman had without doubt as complete control over the shares as the father would have had were he still living. Had a call been made nothing would have relieved Mr. Dennis, jun., from the responsibility of paying it, and that being so he must, of course, be recognised as a shareholder in the fullest sense of the word. It is, however, a matter of little importance, as the majority, even rejecting his shares, would still have been three to one in favour of Capt. Bishop. All I desire is that the committee should publicly explain the principle upon which they acted.

Sept. 21. JUSTICE.

WEST MARIA AND FORTESCUE.

SIR,—As an old shareholder of West Maria and Fortescue, I was pleased to read the letter on Investments and Speculations in last week's Journal, and the clear, straightforward manner in which "Investor" showed the true value of West Maria and some other good mines now selling at an almost nominal price, contrasting favourably with the practice of puffing up some concerns which are started with the knowledge of the promoters that they are not likely to pay. Those fact stated by "Investor" are easily verified, and it is certainly a curious state of things that the mine is selling for 4000*l.* (not the value of its machinery and materials) after the shareholders have spent 54,000*l.* in its development, without taking into account the regular sales of ore and arsenic, which are now paying the costs of the undertaking, and will, there is every reason to believe, soon pay the dividends. In addition to the present satisfactory condition of the company, the fact of its having the same lodes as Devon Great Consols, which it adjoins on the west, is encouraging for its future prospects. Of course those who know the true state of affairs and can afford to hold their shares, can wait quietly, and smile at the blindness on the part of the public, which neglects the substance and seeks with avidity the shadow; but it is otherwise with people in business, who are often compelled to realise for temporary need, and they cannot view with the same complacency as the foregoing the fact that the shares, for which they have paid 4*l.* 10*s.*, they must sell at 3*s.* or 9*s.* if necessary to realise, and this simply on account of the depreciation of good mining stock through the losses occasioned by the worthless concerns got up to extract money from the pockets of the saving portion of the public. But I am happy to say the cloud seems to be already lifting from this long-neglected security, as our cautious brethren in Scotland are now paying more than ordinary attention to the shares, which is a good sign of the way the wind is likely to blow.

Smithfield, Sept. 22. C. J. CATLIN.

[For remainder of Original Correspondence, see to-day's Journal.]

CANADIAN COPPER PYRITES AND CHEMICAL COMPANY.—A circular has been issued by the directors recommending the reconstruction of the company, by which it is believed important advantages may be gained, under the name of the Canadian Copper and Sulphur Company (Limited), with a capital of 330,000*l.*, divided into 82,500 shares of 4*l.* each, of which 47,500 shares would be issued as fully paid up shares, and the remaining 35,000 as shares paid up to the extent of 3*l.* per share. The new company would purchase from the present company its whole estate and assets at the price of 295,000*l.*, being the paid-up amount of its present capital, and payable in shares of the new company. The new company would also take over the whole liabilities and unsettled litigations and arbitrations of the company, and would pay the expenses of its liquidation. The directorate of the new company and the management in Canada would in the first instance be the same as at present. Power would be taken to increase the capital by special resolution for the purpose of purchasing the Huntington Company if arrangements with that object were afterwards made or otherwise for the extension of the company's business, but in the meantime it is not proposed to incorporate the Huntington with the new company. In order to carry out the proposal a provisional offer to purchase the business and assets of the company at the price of 295,000*l.* payable in shares of the new company, has been prepared, and will be submitted to an extraordinary meeting to be held in Glasgow.

THE CAPE COPPER MINING COMPANY.

[Extract from the "Cape Monthly Magazine" for August.]

"THE CAPE REVISITED."

When I first visited Namaqualand, now more than 20 years ago, I approached it from the south by land, encumbered with the expensive paraphanalia of a mule wagon, groaning under the weight of a well-stocked larder, wines and beer of the finest quality, &c., as was the custom of Koper Soekers (the Dutch name for explorers of the mines) in those days; and I this time packed up a few traps in a small portmanteau, stepped on board the greater Namaqua steamer, commanded by that very kind and attentive officer, Capt. Clarke, and trusting to the hospitality of the staff of the Cape Copper Mining Company, ventured on my long and tiresome journey from Cape Town to the famous mine of Ookiep, the central point of attraction in the copperiferous region of Little Namaqualand, without any preparation whatever, and was safely landed on the barren shores of Port Nolloth in less than 40 hours after leaving the docks, without encountering any strange adventure worth relating.

There were then two or three vessels anchored outside awaiting their cargoes of copper ore from the mines, and their position struck me as a most lonely and uncomfortable one, for the shore was not pleasant to look at—one universal waste of white sand, scattered over with a sprinkling of withered-looking bushes, more like stumps of witches' worn out brooms than anything else. The existence of a bar at the entrance to the port, on which the sea in certain winds breaks with considerable violence, prevents vessels above a certain tonnage availing themselves of the shelter afforded by the little indentation in the coast which forms Port Nolloth proper. But Capt. Clarke considers that this little port, gradually growing into one of importance, would at a comparatively trifling cost be capable of great improvement, and even afford safe shelter to a much larger class of vessels than it can do at present, by simply blasting and removing certain masses of large rocks which now impede the deep channel and prevents the scour of the tide through it; which scour, if unimpeded, would have a powerful tendency to deepen the water on the bar, and probably eventually remove it altogether; and certainly, looking at the port on the spot, with the advantage of Capt. Clarke's explanation of his views, I am, as an engineer, of opinion that he is quite right. (The Cape Legislature have since voted 500*l.* for the improvement of Port Nolloth.) The present system adds enormously to the expense of shipping to or from Port Nolloth, as in rough weather for days sometimes no communication can be had with the shipping; and certainly the poor skippers who lie in the outer anchorage must have hard times of it in the winter season. The facilities for landing inside are considerable, owing to the construction of a very convenient wooden jetty, close to which craft of 150 tons may be safely moored. The town or seat of magistracy consists of several rather large and important stores, the different buildings belonging to the Cape Copper Company, a very excellent hotel, a custom house, court house, &c. They are principally of corrugated iron, lined inside with varnished boarding, and affording some very commodious dwellings, but in a high wind so loose is the sand that it must be a very uncomfortable residence, as the fine sand penetrates everywhere, and there is as yet very little vegetation of any kind to restrict it. The water, except that collected from the roofs of the buildings, is brought in casks a distance of 7 or 8 miles, and though clear is rather brack, as indeed is nearly all the water of the district. I need hardly say that all fruit and vegetable must be brought from Cape Town. One peculiarity of the climate on the coast at least is that though rain falls very seldom, there is a very considerable deposit of dew, which condensing on the iron roofs affords a pretty regular supply of fresh water to the cisterns, with which every store or dwelling is amply supplied. At this season of the year at least dense fogs are prevalent until near mid-day.

I found the hotel at Port Nolloth exceedingly comfortable, an excellent table kept, and plenty of fruit and vegetables, in spite of the barren aspect of the country; and the beds clean and comfortable, with a total absence of mosquitoes and other lectuarian tormentors, whose name in our old Saxon phraseology was a synonyme (as it still is in America) of a nightly horror. And here I assure my readers, as a proof of the improved state of domestic cleanliness in this rather warm climate, during a residence of more than six months, including steamers, hotels, and private lodgings, I have not encountered one single specimen of my devout horror, the *Cimex lectuarius*, and this I decidedly cannot say of my experience in my former residence in the colony. It may be well, perhaps, to recollect, when whole villages are now composed of wooden or corrugated iron buildings, that the simple passing over the joints of the flooring, wall, or ceiling boarding, a thick lather of arsenical soap will banish the abhorred insect for ever; and that for iron or other bedsteads the use of a little cocoa nut oil on the joints when putting them together will be equally effectual. But if I go on gossiping this way I will never reach Ookiep or the copper mines to which my footsteps are directed.

I remained in Port Nolloth but one day, but even that exhausted all that was to be seen there; and on the morning of the second day after my arrival I was ready to start on the company's railway for Ookiep, a journey of about 76 miles, which by mule traction on the rail, or rather tramway, is often done in one day, but for comfort's sake still better in two. The railway is so far a complete success, although as now worked by mule traction it can hardly aspire to a loftier denomination than that of a tramway, as two or three rather steep inclines which occur in its course necessitate the employment of a locomotive of a much greater power than is necessary on the lower parts of the line, and the stock of mules at present in possession of the company enables them to work the line with far greater economy than if more powerful locomotives were employed. The gauge is 30 in. The rails, which are very light, and shaped somewhat like a Greek omega, are laid on longitudinal sleepers, forming a continuous line, and the roadway excellently ballasted with a tufaceous limestone, which is found in abundance along the line, and furnishes an elastic and excellent tract-way for the mules at present employed as traction power. From Port Nolloth to the station, Muishondfontein, a distance of about 45 miles, the road, although gradually ascending some 1400 feet, seems to be on an almost dead level, and no cuttings or difficult engineering seem to have been necessary, which enabled this portion of the line to have been completed at an expenditure not exceeding 1000*l.* per mile; but from the foot of the mountain range at the station near Muishondfontein to the summit level near the station Klipfontein (3100 feet), an immense incline rising 1500 feet on a base of 7½ to 8 miles, has to be surmounted in one quick and uninterrupted ascent, down which the loaded wagons from the mine proceed by gravity. When the summit level is obtained there is a tolerably level space of a few miles on the Kookfontein plateau, until near the entrance to Ratelpoort there is another sharp incline of 600 feet, bringing us down to the entrance of Gouraguppoort, from whence we emerge on a tolerably level plateau gradually ascending to Ookiep (3060 feet). The whole of this line is now nearly completed, in excellent order, except a length of about 6 miles at the Ookiep end, which will be finished about the end of the present year. And this little inexpensive and most useful line of railway caused me to make many reflections on its applicability to the colony, where far more expensive lines are now in construction, and whether the simpler and cheaper tramway construction, somewhat modified, would not have supplied us with animal traction as far (say), in the first instance, as Beaufort West, or the line from Uitenhage to Graaff-Reinet and Graham's Town. At the present price of coals, I think oat hay would prove by far the cheapest fuel, and homely mules are by no means a bad substitute for rickety locomotives, besides the encouragement the consumption of both would give to our agriculturists and horse breeders. I found, too, on this line that the fouling of the boilers by the use of brackish water was a cause of much inconvenience and expense, a coating of salt ½ in. in thickness speedily accumulating, causing an immense extra expenditure in fuel in getting up steam, &c. The wagons of the Cape Copper Company are of wrought-iron, with a very low centre of gravity, and carry about 3 tons each. All their couplings and other equipments are of the plainest and most substantial nature, and the mules travel in single file along the rather narrow space between the rails at a rate of about 7 miles an hour, in relays of about 28 miles each span, and do not seem the least distressed, and the mortality amongst them seems very small.

My railway journey from Port Nolloth to Muishondfontein presents nothing very remarkable except the excessive barrenness of the country, on which only 8 in. of rain had fallen during the last two years, the total absence of trees, of which only one exists between the sea and the mountain range, and the industry of the staff of the Cape Copper Company to take advantage of every indication of water existing along the line, all of which has been utilised in a very satisfactory manner, and it is a curious, although I believe a well-known, feature that where springs exist in this barren, desolate region, although at a depth of more than 100 ft., the dried-up, withered vegetation of the surface extends its roots down to these springs through hard beds of almost baked clay. With the exception of seeing two or three jackals crossing the line in one of those interminable prospectives that here occur (one 15 miles in a straight line), animal life there was none, a very few large crows excepted, who appeared hardly to know what to do with themselves. Even snakes, they say, are getting rarer. A dead, monotonous, sandy flat, with a few rocky kopjes or low hills in the distance; but we did not come here expecting fine scenery, and seated in a most comfortable passenger truck, with every necessary or even luxury of life packed on it for use, we got along in the most jolly manner until in the grey of the evening we reached the mountain range, and prepared to ascend to the summit station at Klipfontein, where we were to remain for the night. I confess as we ascended that rugged mountain side, and saw in the waning light the yawning and rugged ravines on either flank of us, hundreds of feet almost perpendicular to the bottom, I felt a sort of sinking of spirit—my courage oozing like Bob Acres', out of my toe nails when I reflected I would have in a few days to descend all this fearful incline by gravity. By Jove, it was quite enough to make any fellow feel grave, especially as I was by no means sure that Kirkaldy's tests had been applied to all our brakes on the adhesive power of which our very lives depended. However, we at last ascended safely, and were kindly welcomed by the present engineer of the line, Mr. Thwaites, at or near the summit level, Klipfontein, at whose hospitable house Mr. Carson and myself remained till the following morning.

Starting again about 9 A.M., we proceeded for some miles along the high plateau of Kookfontein, or Steinkopf, leaving the mission station on our right, and here the line makes a considerable curve to escape rather a rough piece of country, which would have been the most direct line, but attended with enormous expense. A house of accommodation for travellers exists at Kookfontein, for I should here mention that the Cape Copper Company run regular passenger trains three times a week between Port Nolloth and Ookiep. About twelve miles from Kookfontein we reach the head of another rather steep incline descending the ravine, called Ratelpoort, down which we roll by gravity a vertical fall of about 600 ft. in the space of four miles. The sensation would be an agreeable one enough if it was not accompanied by an undefined feeling of danger. Our carriage had two brakes, one before and the other behind; and, as it was a new and untried one, I was recommended to get out and perch myself on a sort of step behind the carriage, and hold on like grim death; so that in case of any accident I might reach the ground as rapidly as possible, or select a place at least where there was good lying ground. The engineer, Mr. Thwaites, managed the hind brake, the driver the fore one. We soon began to spin along pretty lively, and were about half-way down when, to my consternation, Mr. Thwaites began to ascertain that his brake would not act. This, as we were on the very edge of a deep precipice, was by no means satisfactory; but the carriage was proceeding steadily, although a trifle—for my nerves at least—too quickly. However, the brake in front acted famously, and by its means we soon arrived at the bottom of the incline safe and sound. A few miles further on, at a place called Stearfontein, we reached the end of the completed part of the line, when we were met by a cart and four horses, which speedily conveyed us through the Garacoup Pass to Ookiep, a distance of seven or eight miles, passing on the road one of the company's trial mines, but in which the workings are for the present suspended.

Ookiep is a sort of oasis in one of the barrenest deserts that can well be imagined, and its numerous houses, stores, engine-chimneys, &c., are the creation of those immense deposits of mineral wealth which lie hidden below its unpromising surface. I believe I am correct in saying that when the Cape Copper Company was formed the riches of this mine were very imperfectly ascertained, or the price given by the company would have been much higher than it was. However that may be, it eventually turned out to be one of the richest copper mines in existence; and now, at a depth of 80 fathoms, and an immensely increased area of copper-producing ground, it not only shows no signs of exhaustion, but is actually richer than ever, having untouched reserves of the very richest ores in the mine calculated at no less than 40,000 tons in sight, and the great mass of the workings have been hitherto confined to the east side of the shaft, where the ore stretches out to an immense distance, while to the west of the shaft it is reasonable to believe that the ore is equally rich, although as yet almost untouched.

Of the Ookiep Mine and the general administration of the Cape Copper Company, to do it the smallest justice, it would require a very long and separate article to itself. No stranger can imagine the serious responsibilities devolving on the present excellent manager, Mr. E. Carson. He has not only to look after the working operations of the mine—*i.e.*, to get sufficient copper ore not only to the surface, but from Ookiep to Port Nolloth, to load the vessels always anchored there, and anxiously waiting for their freight, but he has to provide for, in the midst of drought of the most intense nature, for the commissariat, in the most extensive sense of the word, of the many hundreds of workmen and sub-officials, both European and native, employed by the company, as regards not only their provisions, but also for their shelter, their medical, and even their educational and spiritual wants, for the company have a staff, including besides merely a mining one, one including medical men, civil engineers, clergymen, schoolmasters, &c., capable of ministering to the wants of the vast number of workmen in their employment, who are not neglected in any point with reference to their benefit, either temporarily or spiritually. Mr. Carson has to provide everything, and sometimes in advance for months he must foresee droughts, and also the continuance of them. He has the anxious task of maintaining his various mule trains, and the difficult one of providing sufficient stores of forage for them; he must have on the beach at Nolloth supplies of ore to meet the calls of the insatiable merchantmen always waiting there for freight. Supplies of fruit and vegetables must be always at hand to prevent a long-dreaded outbreak of scurvy amongst the workmen, while his energies are equally taxed to prevent a too liberal supply of alcoholic liquors, which would tend to disorganise the present general good conduct which distinguishes the mining population in the employment of the company.

In fact, greater responsibilities seldom devolve on the shoulders of any one man. And yet he works them all admirably, everything goes on as smoothly as possible without a single jar or hitch, all his subordinates work together with a will; and without any exaggeration, and having myself a small stake in the matter, I must say that the management of the company could not possibly be in better hands. The difficulties of managing the company's affairs are just now increased by the intense drought which has for the two last years afflicted Little Namaqualand, and which has entirely prevented the unfortunate natives from growing corn for their subsistence on the hill tops where they usually get a good crop if any rain falls. In addition to this I regret to say that at Ookiep the mortality amongst them has been excessive, nearly 300 deaths having occurred at that station alone in a population probably not exceeding 1600 souls, principally from a sort of typhoid fever and the usual effects of famine dysentery. The company, however, have come nobly to the fore, and distributed food amongst the people to the amount of not less than 500*l.* for corn only, besides employing hundreds of not only able-bodied men, but women also, who are busily employed breaking up and sorting the ores. I saw at least one tall strapping Namaqua Princess so employed—indeed, if it was not for the relief so afforded, the whole of the native population would have perished during the last few months. We found working at the mines specimens of nearly all the South African races, Damaras, both Berg and Beest, Ovampos, Coradnas, Namaquas, Bushmen, East Coast Negroes, Malagashes, &c., besides dozens of stalwart Cornish and German miners, who, with their families, are located in snug cottages at Ookiep, each cottage with a garden allotment, and prizes given by the company to whoever shows the best garden at a certain period.

The water supply at Ookiep is nearly all derived from the drainage of the mine, and the strictest analysis cannot detect the slightest trace of copper or any other mineral in it, although it is what is generally known as hard water, and seems impregnated with lime or some other alkaline matter. It is, however, favourable for garden purposes, and I saw several very fair specimens of vegetables grown with it, for without constant watering nothing will grow there, and it is not unpleasant to drink. The different buildings are well provided with tanks and cisterns, and the mine water is led out for irrigation wherever practicable. All the machinery used in working the mines is of the most superior description and in perfect order, and the company's workshops have an ample supply of the best lathes and other tools for keeping it so. The company make no attempt in keeping up any monopoly for the supply of their workpeople. Several large stores exist at Ookiep, the property of private traders, and no restrictions of any kind exist as long as they sell their goods at a fair and reasonable rate, and it has been found beneficial even to abolish the restriction formerly laid on the sale of wine and brandy, as much less drunkenness now exists where liquors are sold more openly than formerly, when their sale was subject to many restrictions or altogether forbidden, which, as usual, caused much smuggling, &c.

While in Namaqualand, I visited the original mining centre—Springbokfontein, but found it utterly exhausted, and the village in ruins, although it is still the seat of the local magistrate, who is there, like Crusoe, "monarch of all he surveys." The mines at Concordia are still at work, but with a very small degree of energy. I saw about 50 tons of pyrites ready for removal, but the parties working it have no dressing machinery of any kind. Indeed, those abandoned mines everywhere present a most melancholy and doleful appearance, and inspire you with a melancholy feeling which the burnt parched-up appearance of the country leads to increase. At Concordia, however, they are building a large new church, while the existing one was alteady too large for the congregation using it.

After spending nearly a week at Ookiep, I took my departure with Mr. and Mrs. Carson for Port Nolloth, and with some degree of fear and trembling again embarked on the incline at Klipfontein; but having a lady with us not very long a wife, I argued rightly, from my own feeling as a married man, that the degree of real danger must have been very small indeed, and so it proved; we ran down the incline in about 18 minutes, and I enjoyed the run exceedingly, arriving safe at the bottom, and in the evening sailed for Cape Town in Namaqua No. 2, surnamed the Little, and after a rather rough passage arrived in about 60 hours in the dock, not at all sorry I assure you, that my voyage in that very limited craft had come to an end. Although the new captain with the fine agricultural name of Stubbington, is as jolly and kind-hearted a skipper as I ever sailed with.

I cannot conclude this article without expressing my conviction how beneficial it would be for the Cape Copper Mining Company to utilise their vast supraterraneous properties by the establishment of a company, with a moderate capital, for the purpose of ostrich and alpaca goat farming. We are aware it has been attempted, but to do it with success a complete and separate establishment from the mining works should be organised. No part of South Africa is more fitted for ostrich farming than Namaqualand, where the Cape Copper Company possess a run of a quarter of a million acres, which, at a very small outlay, can be utilised to pay at least 25 per cent., without any risk, and which the present officials of that company, who have such multifarious duties to attend to, cannot possibly attend to without neglecting their more important duties underground.

STROUSBERGIANA.—A Berlin company, capital of 30,000,000 marks =1,500,000*l.*, half in ordinary shares and half in preference bonds, redeemable by annual drawings at par, has been formed under the title of "Actiengesellschaft für deutsche und böhmische Eisen und Stahl-fabricato," for taking over the property of Dr. Strousberg. The properties are very extensive, including over six dozen iron mines, and a dozen collieries in Bohemia and in various parts of Germany. It is considered that, looking at the present prospects of the coal and iron industries, and as the company take over all the mortgage debts, very careful management will be required to secure the interest payable upon the mortgage debts, which amount to 375,000*l.*, and on the preference bonds—750,000*l.* The purchase money has been fixed at 37,500,000 marks, or 1,875,000*l.*, of which Dr. Strousberg is to receive 15,000,000 marks in ordinary shares, 14,982,000 marks in preference bonds, which with the 7,518,000 marks mortgage debts taken over by the company makes up the amount. The financing of the Strousberg estates surpass in extent either the Emma Mine, Merry and Cuninghame, or any of the other projects of the same class which have been regarded as gigantic in England.

PURIFYING COPPER.—A process has been patented by Mr. S. L CROCKER, of Taunton, Mass., which consists in adding zinc in small quantity in a furnace to the copper ore or ores, or to the partially refined metallic copper ore or ores, or to the partially refined metallic copper therein, containing arsenic and antimony, whereby those impurities can be readily removed.

RIDDLING AND LOADING COAL.—The invention of Mr. GEORGE PARKER, of Denaby, has for its objects the lessening of the manual labour required to load coal and the effecting of the screening thereof at the time of loading. The machine or apparatus is constructed with octagonal-shaped wheels on shafts, to which motion is imparted by suitable gearing. Round these wheels are passed endless chains, across which are fastened projecting bars perforated with openings. This arrangement is carried by a suitable framing fitted with wheels. The coal is placed by manual labour only on to the lowermost of the bars, to which the operation of the octagonal shaped wheels gives a forward and jerking motion, which riddles the small from the serviceably sized coal through the perforations of the bars, and carries the useful coal up to the top level of the corf or other receptacle into which it falls.

REDUCTION OF MERCURY.—The object of the invention of Mr. H. BERRENS, of Paris, is to precipitate or condense all the mercurial vapours that the uncondensable vapour, which accompany it from the furnace, alone shall escape into the outer air, while the vapour of mercury, together with such substances as water, tar, sulphurous acid, pyroligneous acid, or other condensable vapours, shall be found precipitated in the condenser. The sulphurous acid combines with the oxygen of the water, and is precipitated in the form of sulphuric acid.

HOLLOWAY'S OINTMENT AND PILLS.—In these autumnal months the human health is sorely tried by the extreme changes of temperature, which weaken the digestive organs, lower the bodily tone, and lay the system open to numberless complaints. The vast majority of maladies affecting the throat, lungs, and circulation may be checked in their dangerous course by rubbing this curative ointment briskly twice a day upon the skin covering the seat of the ailment, and by taking at the same time appropriate doses of Holloway's purifying, corrective, and operative pills. This simple treatment knows no failure, is devoid of danger, restores strength to frames debilitated by disease, and imparts vigour to the nervous system, however much shaken by repeated illnesses.

FOREIGN MINING AND METALLURGY.

Although almost all the Belgian metallurgical establishments have now work on hand, prices remain without any sensible variation; in other words, they are at a very low level. There does not appear to be any immediate prospect of a change for the better, having regard to the low rates now prevailing in England. As England affords an outlet for Belgian metallurgical products to some extent, English prices necessarily exert some influence on Belgian quotations. The intelligence has been confirmed that 25,000 tons of pig in the Grand Duchy of Luxembourg have been purchased by an association of bankers and commercial agents. An adjudication is to take place at Frankfort, in the first week of October, of 2470 tons of iron girders, 1903 tons of rails, and 255 tons of accessories. An adjudication is about to take place at Strasburg of 1118 tons of Bessemer steel rails and 2877 tons of iron rails for lines in Alsace and Lorraine. Tenders are also to be received for the supply of sundry accessories.

There is scarcely anything fresh to report with respect to the French iron trade. Business has been feeble, and prices continue somewhat discouraging. A recent adjudication for steel rails having taken place in Belgium at 8*l.* 19s. 6d. per ton, and for iron rails at 6*l.* 9s. 6d. per ton, any hopes which have been excited as to an improvement in affairs have been rudely shattered. Both in the Moselle and the Luxembourg pig has continued to be sold upon very cheap terms. The French rolling-mills have very little work on hand, and especially little remunerative work. The steel works have not much to complain of, but it is difficult to say at present what will be the effects of a recent adjudication of steel rails, &c., for the Belgian State lines. MM. Michel Helson and Co. correct an error which has occurred in reference to the financial results of their last year's operations. The loss for the financial year ending June 30, 1875, was 12,600*l.*, and not 32,000*l.* as recently indicated. It must be admitted, however, that even the amended figures are sadly discouraging. Nevertheless, the French iron trade would appear to have fared better during the last two years than the iron trades of Germany, England, or Belgium.

Every week brings the French coal trade nearer to the period when there is usually some revival in affairs, but the improved prices which have been hoped for by French coalowners appear to be as remote as ever. Prices continue firm, but there has been no advance, and there has even been some little diminution of activity during the last few days. The fluctuations which have taken place in the French coal markets for the month past have been, however, comparatively unimportant. Upon the whole, it may be said that there have been no serious fluctuations in prices or business.

The improvement observed in the Belgian coal trade has not become at all more decided; orders for domestic qualities have come to hand freely, but prices have been rather sharply discussed and disputed. Purchasers believe that the late fall has not been carried to its full development; producers fancy, or affect to fancy, that there will be an early advance, hence there is a general disinclination to enter upon long-termed contracts. Of all the Belgian coal basins the Liége district shows the least animation. In this group there are also many complaints as to the languishing condition of metallurgical industry. In the Liége basin stocks of coal are heavy, but the Mons district, on the contrary, makes regular deliveries both by water and railway, and stocks have been rapidly declining in consequence. Since coal has become dearer than it used to be turf seems likely to play a more important part. Works have been established at Norrkoping, in Sweden, where small tubes of turf are made; this form promotes the drying of the turf, and also encourages combustion, rendering the "tubular turf" well adapted for steam-engine consumption. A report by M. Laguesse, mining engineer and director of mines in the province of Hainaut, gives some interesting information with reference to the working of collieries in that province in 1874, as compared with 1873 and 1872. It appears from the report of M. Laguesse that the production of coal in the Hainaut last year was 10,698,130 tons, of the estimated value of 7,137,857*l.* As compared with that of 1872 and 1873, the production of 1874 shows a diminution of 918,036 tons, and 954,823 tons respectively; it presents, however, an increase of 660,000 tons as compared with 1871. The number of workmen employed in the province last year was 80,075, against 79,556 in 1873; the average annual wages paid were 47*l.* 16s. per man last year, as compared with 56*l.* 5s. per man in 1873. The average cost price was 13s. 1d. per ton in 1873, as compared with 12s. 2d. per ton in 1874. The average selling price was 17s. 7d. per ton in 1873, and 13s. 5d. per ton in 1874. Some 60 mines were worked last year in the province at a profit, as compared with 72 in 1874. The 60 mines worked profitably last year yielded an aggregate profit of 905,327*l.* The loss sustained by the 29 mines worked unprofitably last year was 249,352*l.* The general result of the year's operations will be seen to have been a profit of 655,975*l.* The stocks in hand at the close of 1874 were estimated at 402,516 tons, while those held at the close of 1873 were 282,099 tons. Working operations were carried on last year at 203 points, as compared with 202 points in 1874. The coal mines of the Hainaut employed last year 1161 engines of an aggregate of 66,062-horse power. The number of accidents last year in the coal mines of the Hainaut was 152; by these accidents 265 workmen perished, and 52 were wounded. The number of killed last year was less than in 1873, but there was a slight increase in the number of wounded.

The Paris copper market has presented little change. There have been few speculative transactions, but the consumptive demand has remained good, and has sufficed to maintain prices. Chilian in bars, delivered at Havre, has made 88*l.*; ditto, ordinary descriptions, 86*l.*; ditto, in ingots, 90*l.*; English tough cake, 89*l.*; and pure Corocoro minerals, 87*l.* per ton. Copper has become rather weaker upon the Marseilles market. There has been a little more animation upon the German copper markets. Quotations for tin are maintained pretty well at Paris; Banca, delivered at Havre or Paris, has made 95*l.*; ditto, Straits, 88*l.*; and English, delivered at Havre or Rouen, 89*l.* per ton. The Dutch tin markets have continued firm, in consequence of the improved tone of the London tin market; business has, however, been somewhat restricted, sellers demanding prices which buyers have refused to pay. Some transactions have taken place in disposeable Banca at 52½ fls. to 52¾ fls.; and for delivery at the approaching sale at 52½ fls. Disposeable Billiton is held at 50 fls.; a transaction with delivery next month is reported at 49¾ fls. Tin has somewhat improved in price upon the German markets. Lead has maintained its price at Paris, and higher rates are even anticipated in the autumn; the general quotation has been 23*l.* 12s. per ton. The Marseilles lead market has been sustained wholly by the consumptive demand; orders for export completely make default. Lead has been further tending upwards at Cologne. Silesian zinc has brought 26*l.*, and other good marks 25*l.* 12s. per ton. Vieille Montagne zinc, in sheets, has made 32*l.* per ton.

PATENT IRON OR METAL WHEELS.—A novelty as to iron and metal wheels has for sometime past engaged the attention of Mr. W. ARNOLD, of Bernsley, and after much labour bestowed upon it, he has now patented it. The boss of the wheel is made of iron in two parts. The bush, which should be a chilled one, is so constructed as to be taken out and replaced by a new one. The bush is formed with a recess at the small end to fit on the boss. The large end is cast with a small flange at about ½ in. from the end so as to admit of a wrought-iron flange, with counter-sunk holes for bolts to pass through the two bosses, and hold the bush in its place. The spokes of the wheel are made of circular plate iron. There is dishing, sectioning, and strengthening by a bead round the bolt, also with T or other sections of iron. The rim of the wheel is made of two solid angle iron rings and rivetted to the boxed plates. The rim is of one solid ring, and is put on so as to brace the whole together.

COMPRESSED-AIR LOCOMOTIVES.—The invention of Mr. LEON REBOURT, of Altorf Canton Uri, Switzerland, relates to locomotives worked by compressed air provided with pressure regulating apparatus, which is applicable when steam or gases under pressure are employed to produce motive-power. The locomotive is like one of ordinary construction, having instead of a boiler a large and strong reservoir which is charged with compressed air, and having large cylinders so as to work with moderate pressure under that of the partly exhausted reservoir. Between the main reservoir and the cylinders are placed the regulating apparatus and a small subsidiary reservoir in the course of the pipe from the regulator to the cylinders. The regulator consists of two pistons connected together, fitted to work in a cylinder open at one end to the air and at the other end communicating with the subsidiary reservoir, while the middle space between the two pistons communicates with the main reservoir, and also by side holes with the subsidiary reservoir, these holes being governed by a slide attached to the pistons The pistons are pressed inwards by the atmosphere and by an adjustable spring, and outwards by the fluid at the working pressure in the subsidiary reservoir, and according as the latter pressure exceeds or falls short of the atmospheric pressure aided by the spring, so the slide covers or uncovers more or less the holes in the cylinder; and thus, notwithstanding considerable variation of pressure in the main reservoir, the working pressure in the subsidiary reservoir is maintained constant or nearly so, and within limits may be varied by altering, by an adjusting screw, the force of the spring.

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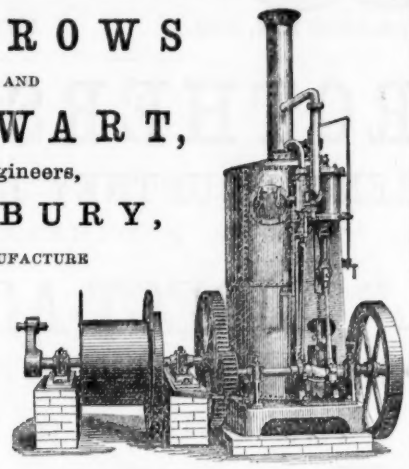

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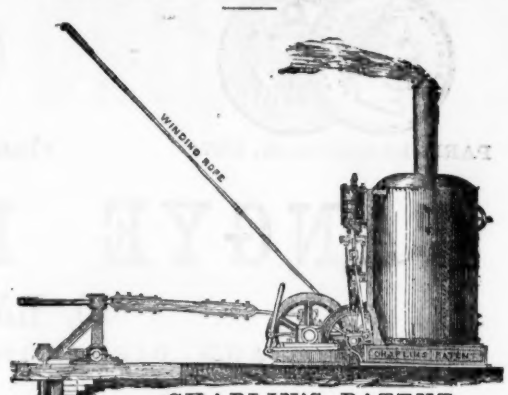

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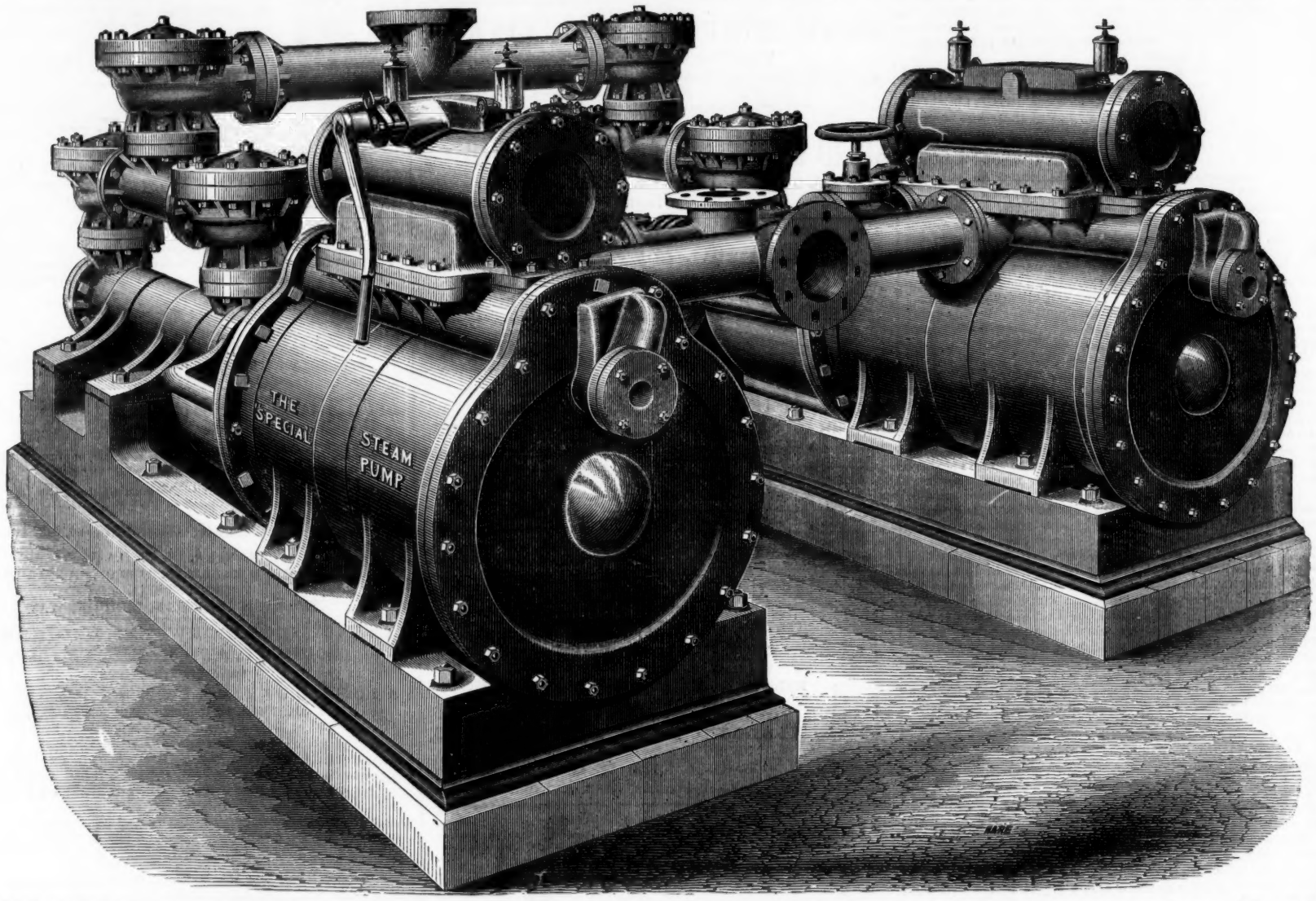

PAIR OF THE "SPECIAL" DIRECT-ACTING STEAM PUMPS SUITABLE FOR HIGH LIFTS IN MINES, SIMILAR TO MANY SUPPLIED BY TANGYE BROTHERS AND HOLMAN.

The following extract from a letter, received by Tangye Brothers and Holman from J. Bigland, Esq., dated Feb. 25, 1875, refers to a "Special" Direct-acting Steam Pumping Engine supplied four years ago to Messrs. Joseph Pease and Partners, for the Adelaide Colliery, Bishop Auckland. The engine is throwing about 8000 gallons per hour, 1040 feet high, in one direct lift:—

"The underground pumping engine at Adelaide Colliery is working night and day. It does its work satisfactorily, and gives us very little trouble. Some of the cup leathers which form the plunger packing have worked three months. The working barrel is in beautiful condition. The average duration of the valve seats is about eight months; they work and keep tight as long as there is a bit of them left. I expect the valves (Holman's patent) and the buffers will last as long as the colliery."

Extract from a letter received by Tangye Brothers and Holman from W. H. Eagland, Esq., dated Feb. 27, 1875, in reference to a "Special" Direct-acting Steam Pumping Engine supplied two years ago to the West Yorkshire Iron and Coal Company near Leeds, to throw 16,000 gallons per hour, 465 feet high, in one direct lift:—

"It is at work night and day. Our man goes down to the pump twice a day (Ten A.M. and Four P.M.), to supply the tallow cups. After this it is left every day till he comes next morning, when he goes down again at Ten A.M. as before. The only repairs the pump has had for 12 months are one bucket, which had worked since we got the pump, and one valve seat, but no valve, so it has cost very little. Its first lift is 70 yards perpendicular, then the water passes up pipes for half a mile, ascending another 70 yards, and then another perpendicular pipe of 15 yards —total, 155 yards vertical height."

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Diameter of Steam Cylinder .....In.	7	8	9	9	10	10	12	12	12	14	14	14	16	16	16	16	18	18	18	18	21	21	21
Ditto of Water Cylinder .....In.	3	3	3	4	3	4	3	4	5	4	5	6	4	5	6	7	5	6	7	8	5	6	7
Length of stroke .....In.	24	24	24	24	36	24	36	36	36	36	36	36	36	36	36	36	48	36	36	36	48	48	36
Gallons per hour approximate	1830	1830	1830	3250	1830	3250	1830	3250	5070	3250	5070	7330	3250	5070	7330	9750	5070	7330	9750	13,000	5070	7330	9750
Height in feet to which water can be raised with 40 lbs. pressure per sq. in. of steam or compressed air at pump	325	425	540	300	665	375	960	540	345	735	470	330	960	615	426	312	775	540	400	300	1058	740	540

CONTINUED.

Diameter of Steam Cylinder .....In.	21	21	21	24	24	24	24	24	26	26	26	26	26	30	30	30	30	30	32	32	32	32	32
Ditto of Water Cylinder .....In.	8	9	10	6	7	8	9	10	7	8	9	10	12	8	9	10	12	14	8	9	10	12	14
Length of stroke .....In.	36	36	36	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
Gallons per hour approximate	13,000	16,519	20,000	7330	9750	13,000	16,519	20,000	9750	13,000	16,519	20,000	30,000	13,000	16,519	20,000	30,000	40,000	13,000	16,519	20,000	30,000	40,000
Height in feet to which water can be raised with 40 lbs. pressure per sq. in. of steam or compressed air at pump	413	326	264	960	700	540	427	345	827	633	500	405	282	840	665	540	375	275	960	758	625	426	313

PRICES OF ABOVE ON APPLICATION.—FOR SIZES AND PRICES OF PUMPS FOR LOWER LIFTS SEE SEPARATE LIST.

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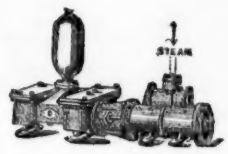

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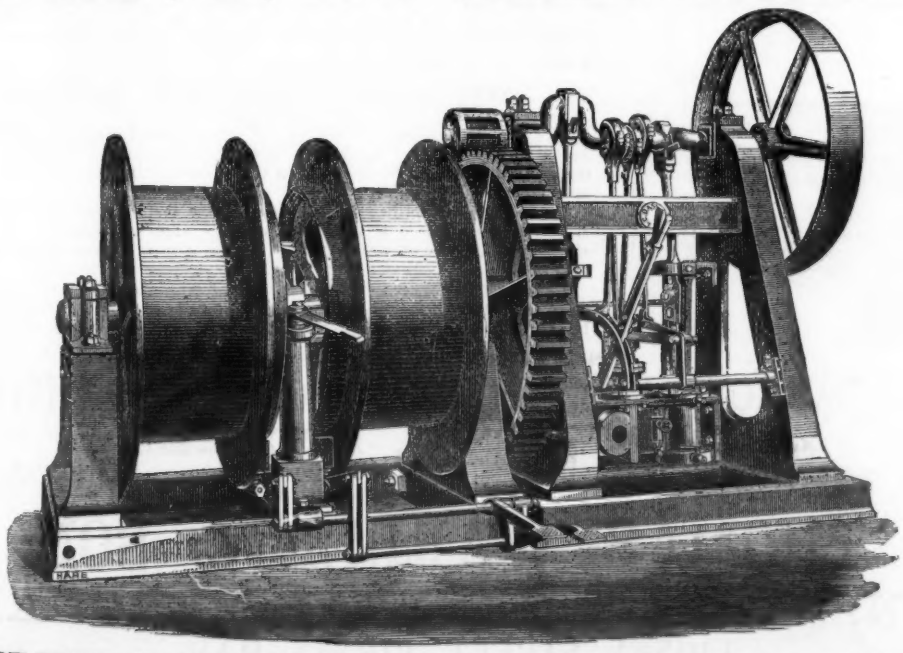

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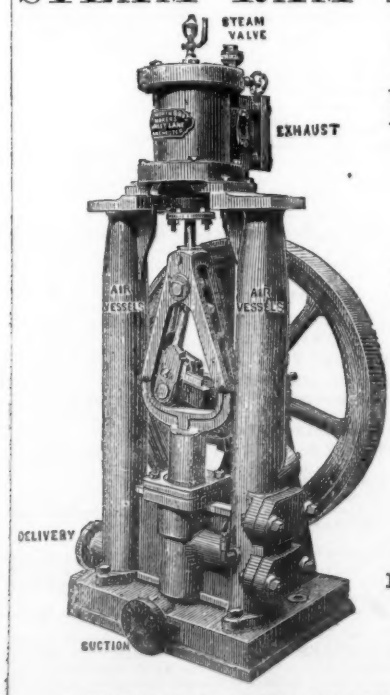

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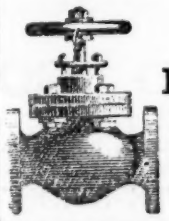

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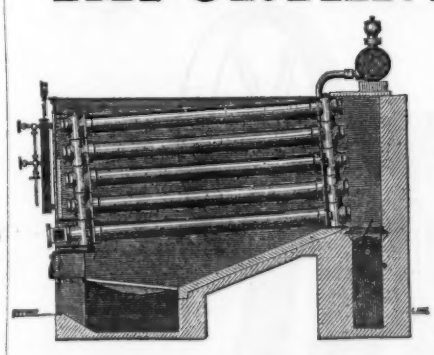

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Desire to call the attention of Steam Users to some important improvements recently introduced in these Boilers, by which any points of objection to previous designs are entirely overcome, whilst the valuable principle, so widely recognised, is retained.

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